



MODEL M1109 COMBO LATHE/MILL



OWNER'S MANUAL

Phone: (360) 734-3482 • Online Technical Support: tech-support@shopfox.biz

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WARNING: NO PORTION OF THIS MANUAL MAY BE REPRODUCED IN ANY SHAPE OR FORM WITHOUT
THE WRITTEN APPROVAL OF WOODSTOCK INTERNATIONAL, INC.



WARNING!

This manual provides critical safety instructions on the proper setup, operation, maintenance and service of this machine/equipment.

Failure to read, understand and follow the instructions given in this manual may result in serious personal injury, including amputation, electrocution or death.

The owner of this machine/equipment is solely responsible for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training and usage authorization, proper inspection and maintenance, manual availability and comprehension, application of safety devices, blade/cutter integrity, and the usage of personal protective equipment.

The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.



WARNING!

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- Lead from lead-based paints.
- Crystalline silica from bricks, cement and other masonry products.
- Arsenic and chromium from chemically-treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: Work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

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INTRODUCTION

Woodstock Technical Support

Your new **SHOP FOX®** Model M1109 Combo Lathe/Mill has been specially designed to provide many years of trouble-free service. Close attention to detail, ruggedly built parts and a rigid quality control program assure safe and reliable operation.

Woodstock International, Inc. is committed to customer satisfaction. Our intent with this manual is to include the basic information for safety, setup, operation, maintenance, and service of this product.

We stand behind our machines! In the event that questions arise about your machine, please contact Woodstock International Technical Support at (360) 734-3482 or send e-mail to: tech-support@shopfox.biz. Our knowledgeable staff will help you troubleshoot problems and process warranty claims.

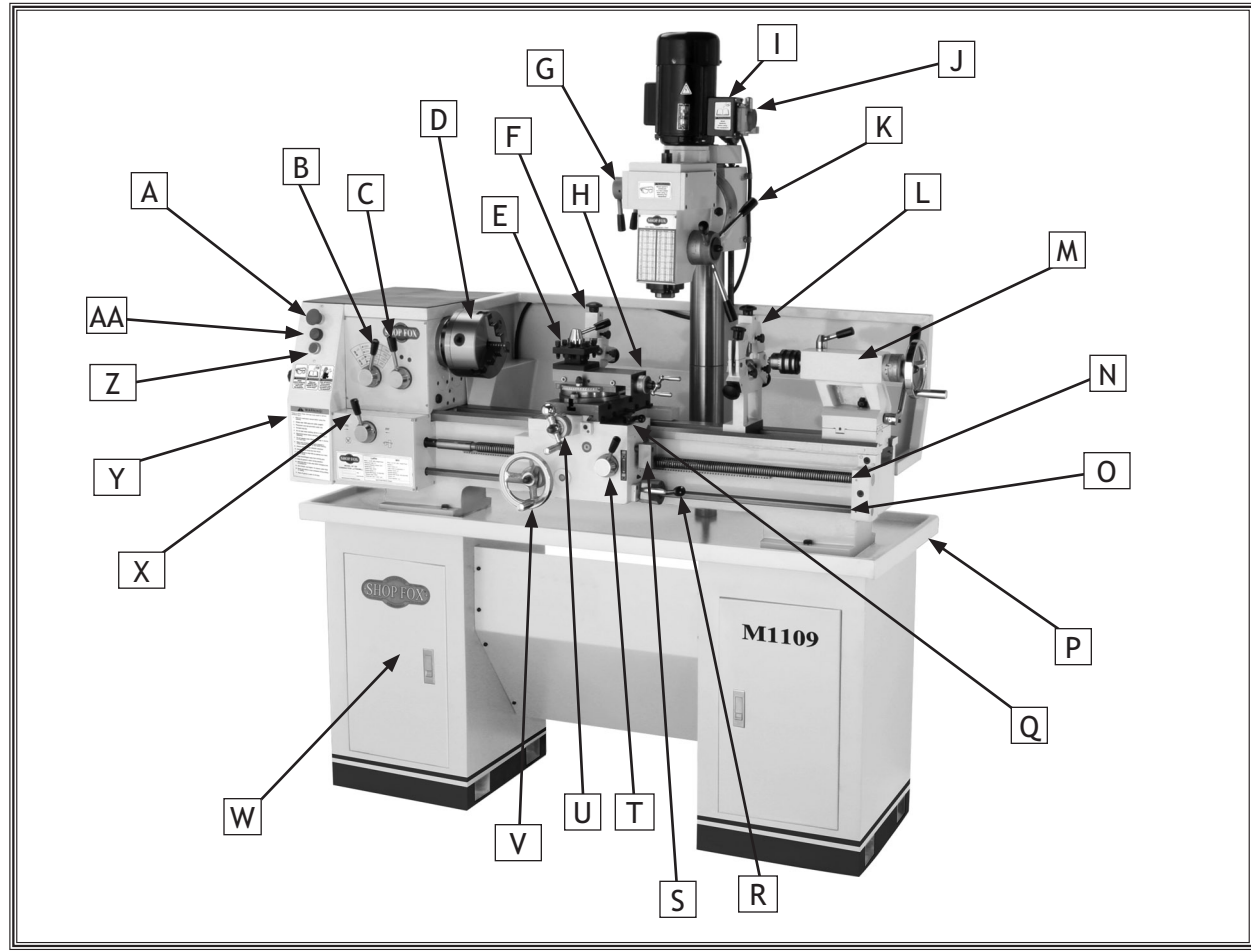
If you need the latest edition of this manual, you can download it from <http://www.shopfox.biz>.
If you have comments about this manual, please contact us at:

Woodstock International, Inc.
Attn: Technical Documentation Manager
P.O. Box 2309
Bellingham, WA 98227

Specifications

Milling Motor.....	$3/4$ " HP, 220V, 7 Amps, Single-Phase, TEFC
Lathe Motor	$1\frac{1}{2}$ " HP, 220V, 10 Amps, Single-Phase, TEFC
Lathe Swing Over Bed	12 $\frac{1}{2}$ "
Mill/Drill Swing.....	14 $\frac{1}{2}$ "
Mill/Drill Spindle to Worktable Capacity	17 $\frac{1}{4}$ "
Distance Between Centers	29 $\frac{1}{2}$ "
Spindle Bore	1 $\frac{1}{2}$ "
Lathe Spindle Taper	MT #5
Mill/Drill Spindle Taper	R8, $7/16$ "-20 TPI
Tailstock Taper	MT #3
Tailstock Barrel Travel	3 $\frac{15}{16}$ "
Cross Slide Travel	6 $\frac{1}{4}$ "
Number of Mill/Drill Speeds	4
Mill/Drill Speed Range	240, 600, 1100, 2700 RPM
Tilting Headstock	90° L & R
Number of Lathe Speeds	12
Lathe Speeds.....	75, 110, 140, 200, 240, 350, 420, 600, 720, 1050, 1250, 1900 RPM
Thread Range (inches)	27 @ 8 - 120 TPI
Thread Range (metric).....	18 @ 0.2 - 3.0 mm
4-Jaw Chuck.....	8"
3-Jaw Chuck.....	w/Int. & Ext. Jaws, 6"
Drill Chuck.....	1-13mm JT-33
Faceplate	8"
Tool Holder	4-Way Turret Tool Post
Change Gears.....	Steel
Dead Centers	MT5 & MT3
Approximate Net Weight	1200 lbs.

Controls and Features



M1109 Combo Lathe/Mill.

- | | |
|---|--|
| <ul style="list-style-type: none"> A. Lathe Emergency Stop Button B. Spindle Speed Lever C. Spindle Range Lever D. 3-Jaw Chuck E. Four-Way Tool Post F. Follow Rest G. Milling Speed Levers H. Compound Rest I. Elevation Handwheel J. Mill Power/Emergency Stop Button K. Milling Rack Handles L. Follow Rest M. Tailstock N. Lead Screw | <ul style="list-style-type: none"> O. Feed Rod P. Chip Tray and Drip Pan Q. Longitudinal and Cross Feed Lever R. Spindle ON/OFF Rotation Lever S. Thread Dial T. Half Nut Lever U. Cross Slide Handle V. Manual Feed Hand Wheel W. Storage Cabinet X. Lead Screw Direction Lever Y. Side Cover Z. Jog Button AA. Power Lamp |
|---|--|

SAFETY

**READ MANUAL BEFORE OPERATING MACHINE.
FAILURE TO FOLLOW INSTRUCTIONS BELOW WILL
RESULT IN PERSONAL INJURY.**



Indicates an imminently hazardous situation which, if not avoided, **WILL** result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate injury.

NOTICE

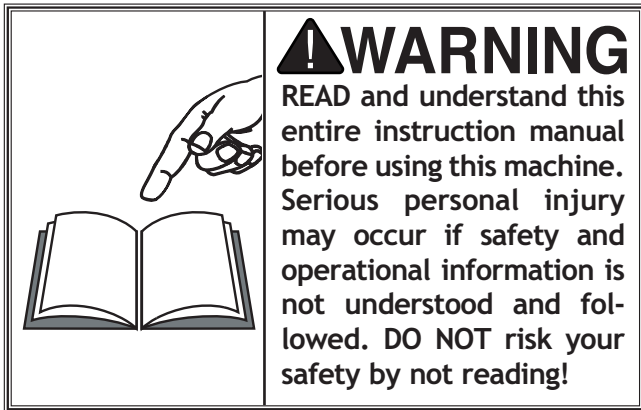
This symbol is used to alert the user to useful information about proper operation of the equipment, and/or a situation that may cause damage to the machinery.

Standard Safety Instructions

1. **Thoroughly read the Instruction Manual before operating your machine.** Learn the applications, limitations and potential hazards of this machine. Keep the manual in a safe and convenient place for future reference.
2. **Keep work area clean and well lighted.** Clutter and inadequate lighting invite potential hazards.
3. **Ground all tools.** If a machine is equipped with a three-prong plug, it must be plugged into a three-hole grounded electrical receptacle or grounded extension cord. If using an adapter to aid in accommodating a two-hole receptacle, ground using a screw to a known ground.
4. **Wear eye protection at all times.** Use safety glasses with side shields or safety goggles that meet the appropriate standards of the American National Standards Institute (ANSI).
5. **Avoid dangerous environments.** Do not operate this machine in wet or open flame environments. Airborne dust particles could cause an explosion and severe fire hazard.
6. **Ensure all guards are securely in place and in working condition.**
7. **Make sure switch is in the OFF position** before connecting power to machine.
8. **Keep work area clean, free of clutter, grease, etc.**
9. **Keep children and visitors away.** Visitors must be kept at a safe distance while operating unit.
10. **Childproof your workshop** with padlocks, master switches or by removing starter keys.
11. **Stop and disconnect the machine when cleaning, adjusting or servicing.**

12. **Do not force tool.** The machine will do a safer and better job at the rate for which it was designed.
13. **Use correct tool.** Do not force machine or attachment to do a job for which it was not designed.
14. **Wear proper apparel.** Do not wear loose clothing, neck ties, gloves, jewelry, and secure long hair away from moving parts.
15. **Remove chuck keys, rags, and tools.** Before turning the machine on, make it a habit to check that all chuck keys and wrenches have been removed.
16. **Avoid using an extension cord.** But if you must use one, examine the extension cord to ensure it is in good condition. Immediately replace a damaged extension cord. Always use an extension cord that uses a ground pin and connected ground wire. Use an extension cord that meets the amp rating on the motor nameplate. If the motor is dual voltage, be sure to use the amp rating for the voltage you will be using. If you use an extension cord with an undersized gauge or one that is too long, excessive heat will be generated within the circuit, increasing the chance of a fire or damage to the circuit.
17. **Keep proper footing and balance** at all times.
18. **Lock the mobile base from moving before feeding the workpiece into the machine.**
19. **Do not leave machine unattended.** Wait until it comes to a complete stop before leaving the area.
20. **Perform machine maintenance and care.** Follow lubrication and accessory attachment instructions in the manual.
21. **If at any time you are experiencing** difficulties performing the intended operation, stop using the machine! Then contact our technical support or ask a qualified expert how the operation should be performed.
22. **Be aware that certain materials may cause an allergic reaction in people and animals,** especially when exposed to fine dust. Make sure you know what type of material dust you will be exposed to and the possibility of an allergic reaction.
23. **Habits—good and bad—are hard to break.** Develop good habits in your shop and safety will become second-nature to you.

Additional Safety Instructions for Lathe/Mills



1. **UNDERSTANDING THE MACHINE:** Read and understand this manual before operating machine.
2. **CLEANING MACHINE:** Do not clear chips by hand. Use a brush, and never clear chips while the lathe is turning.
3. **USING CORRECT TOOLING:** Always select the right cutter for the job, and make sure cutters are sharp. The right tool decreases strain on the lathe components and avoids unsafe cutting.
4. **ELIMINATING A PROJECTILE HAZARD:** Always remove the chuck key, and never walk away from the lathe leaving the chuck key installed.
5. **SECURING A WORKPIECE:** Make sure workpiece is properly held in chuck before starting lathe. A workpiece thrown from the chuck will cause severe injury.
6. **CHUCK SAFETY:** Chucks are surprisingly heavy and awkward to hold, so protect your hands and the lathe ways. Always use a chuck cradle or piece of plywood over the lathe ways.
7. **WORKPIECE SUPPORT:** Support a long workpiece if it extends from the headstock so it will not wobble violently when the lathe is turned on. If workpiece extends more than 2.5 times its diameter from the chuck, support it by a center or steady rest or it may deflect and fall out of the chuck during cutting.
8. **AVOIDING STARTUP INJURIES:** Make sure workpiece, cutting tool, and tool post have adequate clearance before starting lathe. Check chuck clearance and saddle clearance before starting the lathe. Make sure spindle RPM is set correctly for part diameter before starting the lathe. Large parts can be ejected from the chuck if the chuck speed is set too high.
9. **AVOIDING OVERLOADS:** Always use the appropriate feed and speed rates.
10. **AVOIDING ENTANGLEMENT INJURIES:** Never attempt to slow or stop the lathe chuck or mill spindle by hand; and tie back long hair, ponytails, loose clothing, and sleeves so they do not dangle.
11. **MAINTAINING A SAFE WORKPLACE:** Never leave lathe unattended while it is running.
12. **PREVENTING AN APRON-CHUCK CRASH:** Always release automatic feeds after completing a job.

Avoiding Potential Injuries

SAFETY

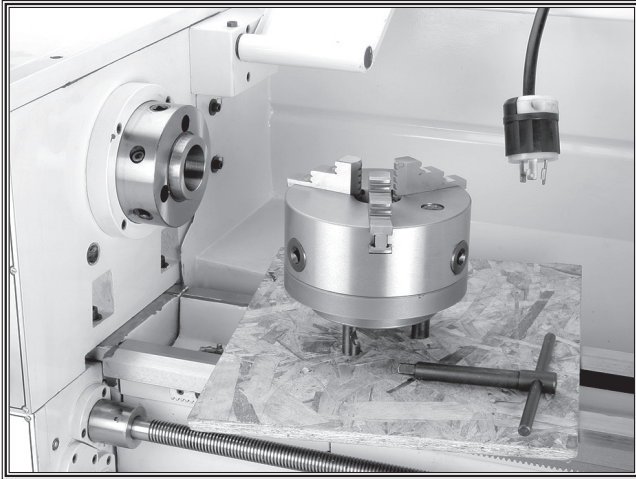


Figure 1. Always protect the bed ways, and unplug the lathe/mill when retooling.



Figure 3. Always wear face and eye protection when using this lathe/mill.

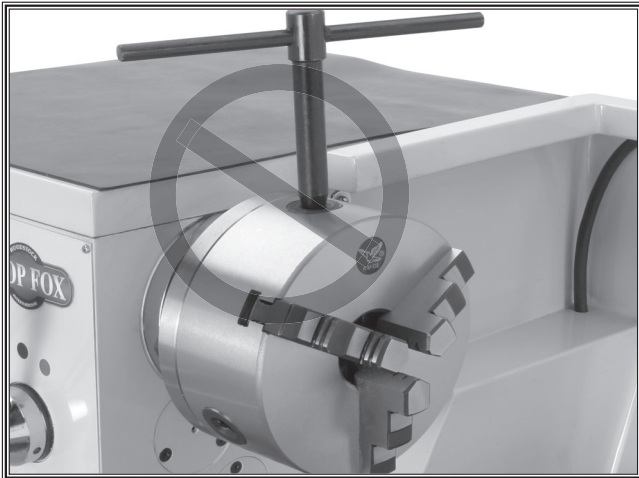


Figure 2. Never walk away from the lathe/mill leaving the chuck key inserted in the chuck.

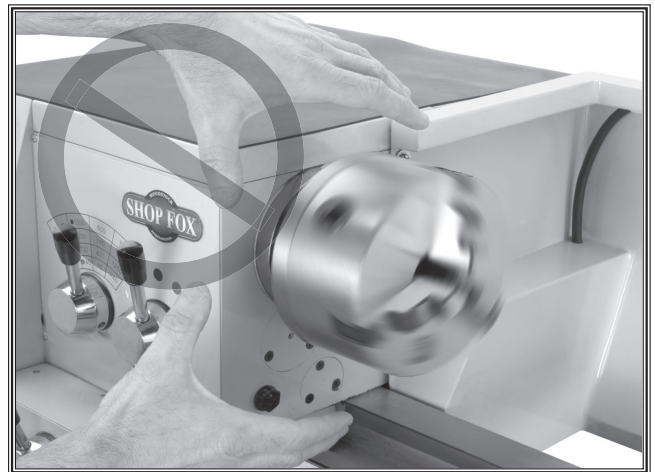


Figure 4. Never use hands to stop or slow the chuck when shutting down the lathe/mill.

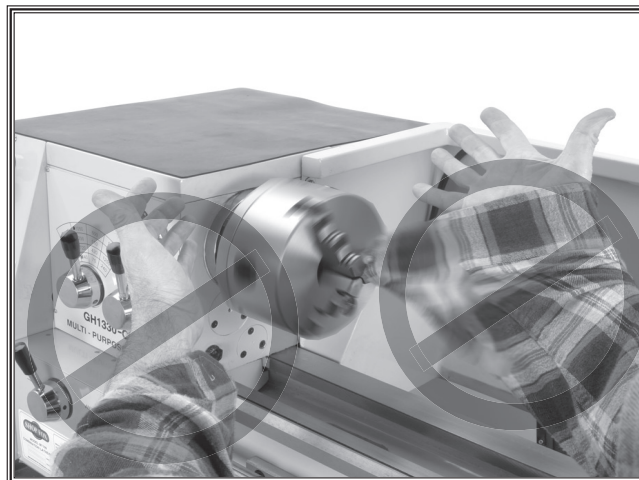


Figure 5. Never wear loose clothing or gloves when working with the lathe/mill.

ELECTRICAL

220V Operation

The SHOP FOX® MODEL M1109 Combo Lathe/Mill operates at 220 volt single-phase only. Only connect this machine to a dedicated circuit (wire, breaker, plug, receptacle) with a verified ground, using the recommended circuit size and NEMA 6-20 plug/receptacle (Figure 6) listed at the bottom of this page.

Never replace a circuit breaker with one of higher amperage without consulting a qualified electrician to ensure compliance with wiring codes. If you are unsure about the wiring codes in your area or plan to connect your machine to a shared circuit, you may create a fire hazard—consult a qualified electrician to reduce this risk.

Extension Cords


We do not recommend using an extension cord for 220V operation. When it is necessary to use an extension cord, use the following guidelines:

- Use cords rated for Standard Service
- Never exceed a length of 50 feet
- Ensure cord has a ground wire and pin
- Do not use cords in need of repair

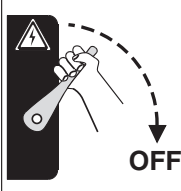
Grounding

This machine must be grounded! Verify that any existing electrical outlet and circuit you intend to plug into is actually grounded. If it is not, it will be necessary to run a separate copper grounding wire, of the appropriate size, from the outlet to a known ground. Under no circumstances should you connect your machine to an ungrounded power source or electrocution or severe shock could occur.

⚠ WARNING



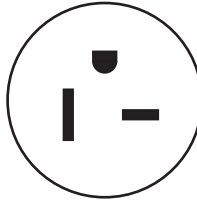
DO NOT attempt to work on your electrical system if you are unsure about electrical codes and wiring! Seek assistance from a qualified electrician. Ignoring this warning can cause electrocution!



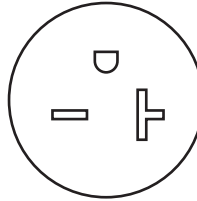
OFF

⚠ WARNING

TURN OFF and LOCK your master power switch so no power is available to the lathe/mill before connecting electrical wires! If you ignore this warning serious electrical shock may occur, causing injury or death!



6-20P



6-20R

Figure 6. NEMA 6-20 plug and receptacle.

Operating Voltage	Full Load Amp Draw	Min. Circuit Size	Plug/Receptacle	Extension Cord
220V Single-Phase	17 Amps	20A	NEMA 6-20	12 Gauge

ELECTRICAL

SETUP

Inventory

The following is an inventory of the accessories shipped with your SHOP FOX® Model M1109 Lathe/Mill.

Installed Accessories (Figure 7)	Qty.
A. 6" Three-Jaw Chuck	1
B. 4-Way Tool Post and Compound Rest	1
C. Follow Rest	1
D. Compound Rest	1

Packaged Accessories (Figure 8)	Qty.
E. 8" Four-Jaw Universal Chuck	1
F. 8" Faceplate	1
G. Four-Jaw Chuck Key	1
H. Drill Chuck (1-13mm, JT-33)	1
I. Wrench Set (8/10, 10/12, 14/17, 17/19 mm)....	1 EA
J. Hex Wrench Set (2, 4, 6, 8 mm).....	1 EA
K. Three-Jaw Chuck Key	1
L. Oil Can	1
M. Dead Center MT#5.....	1
N. #2 Standard Screwdriver	1
O. Wedge	1
P. Tool Post T-Handle Wrench.....	1
Q. Dead Center MT#3.....	1
R. Three-Jaw Chuck Internal Jaws.....	3
S. Taper Adapter MT#3 to MT#5	1
T. Arbor JT-33 to MT#3	1
U. Spot Paint.....	1
V. Drill Chuck Key.....	1
W. Change Gear Set.....	1
– Keyed Drive Gear (24-fine Tooth), (Installed)	1
– Keyed Drive Gear Set (28 & 35-Coarse Tooth).....	1
– Change Gear (24-tooth, One Installed)	2
– Change Gear (25-tooth, One Installed)	2
– Change Gear (27-tooth)	1
– Change Gear (28-tooth)	1
– Change Gear (30-tooth)	1
– Change Gear (32-tooth)	2
– Change Gear (34-tooth)	1
– Change Gear (35-tooth)	1
– Change Gear (36-tooth)	1
– Change Gear (40-tooth)	1
– Change Gear (42-tooth)	1
– Change Gear (44-tooth)	1
– Change Gear (46-tooth)	1
– Change Gear (48-tooth, Installed).....	1
– Change Gear (50-tooth, Installed).....	1
– Change Gear (52-tooth)	1
– Change Gear (60-tooth, Installed).....	1

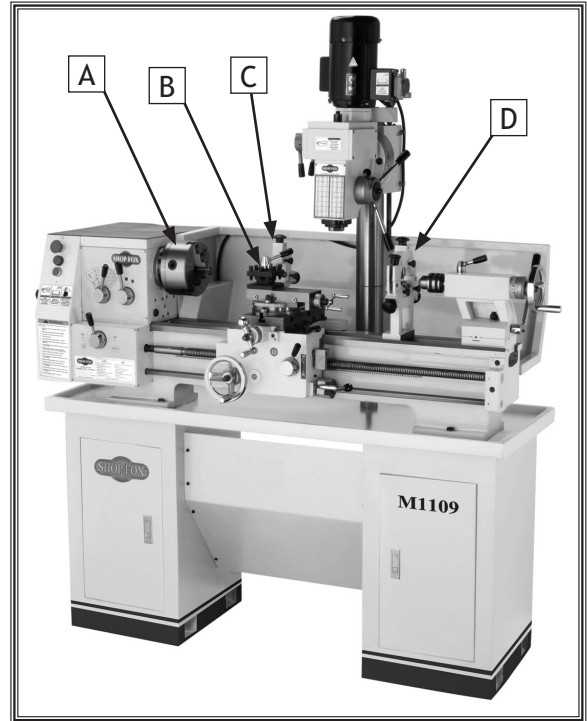


Figure 7. Installed accessories.

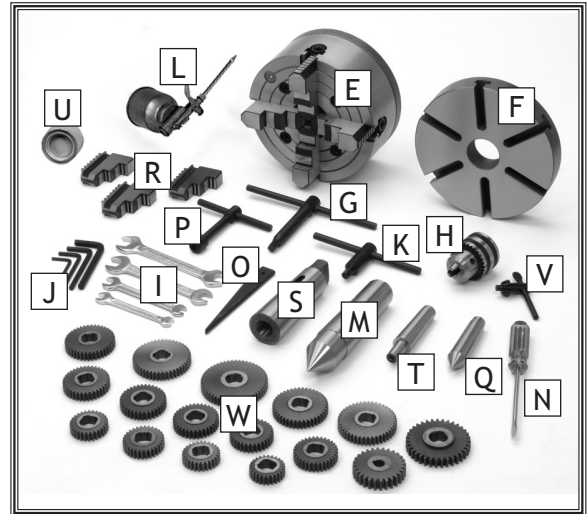


Figure 8. Packaged accessories.

NOTICE

If any parts are missing, find the part number in the back of this manual and contact Woodstock International, Inc. at (360) 734-3482 or at tech-support@shopfox.biz.

SETUP

Cleaning Machine


The ways and other unpainted parts of your lathe/mill are coated with a waxy grease that protects them from corrosion during shipment. Clean this grease off with a solvent cleaner or citrus-based degreaser. DO NOT use chlorine-based solvents such as brake parts cleaner, lacquer thinner, or acetone—if you happen to splash some onto a painted surface, you will ruin the finish.

Machine Placement

- **Floor Load:** Your lathe/mill is a heavy load (1200 lbs.) distributed in a 61³/₄" x 27¹/₂" footprint. Place this machine on concrete floors only. The floor MUST be level, or the lathe/mill frame and ways may distort over time.
- **Working Clearances:** Consider existing and anticipated needs, service panel access, length of rods to be loaded into the lathe/mill, and space for auxiliary stands, work tables or other machinery when establishing a location for your lathe/mill (see Figure 9 for minimum wall clearances).
- **Lighting:** Lighting should be bright enough to eliminate shadow and prevent eye strain.
- **Electrical:** Outlets must be located near each machine, so power cords are clear of high-traffic areas. Follow local electrical codes for proper installation.



! WARNING
ALWAYS work in well-ventilated areas far from possible ignition sources when using solvents to clean machinery. Many solvents are toxic when inhaled or ingested. Use care when disposing of waste rags and towels to be sure they **DO NOT** create fire or environmental hazards. **NEVER** use gasoline or petroleum-based solvents to clean your lathe/mill.



! WARNING
MAKE your shop "child safe." Ensure that your workplace is inaccessible to youngsters by closing and locking all entrances when you are away. **NEVER** allow untrained visitors in your shop when assembling, adjusting or operating equipment.

SETUP

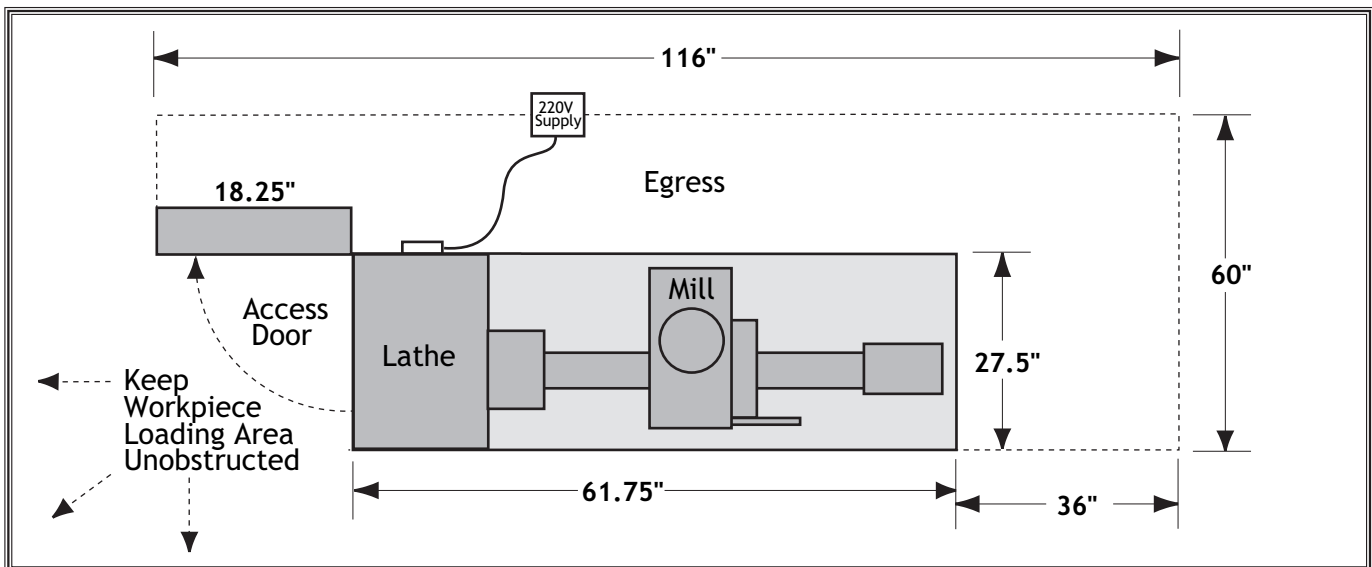


Figure 9. Minimum wall clearances.


Uncrating and Lifting

This lathe/mill has been carefully crated. If you notice it has been damaged, contact your authorized SHOP FOX® dealer immediately.

To unpack and move the lathe/mill, do these steps:

1. Read **Pages 9 & 11** to prepare the lathe/mill location, and install or prepare holes for any floor mounting fasteners (**Figure 11**).
2. Gather the following items:
 - Fork Lift or 2-ton hoist, and driver or operator.
 - 1 Ton lifting straps and hooks.
3. Unbolt the crate sides and remove the top and sides.
4. Insert two lifting straps under the bedways and behind the feed rod and the lead screw as shown in **Figure 10** , and support the lathe with the lifting straps and lifting device.
5. Move the apron so it located between the headstock and the mill column as shown in **Figure 10** to balance the load.
6. Unbolt the lathe/mill from the pallet.
7. Slowly raise the lathe/mill off of the pallet and carefully move the lathe/mill to your prepared location.
8. With the lathe/mill securely resting on the floor, shim between the floor and cabinet base as required to make the ways level at all four corner locations as indicated with a machinist's level.
9. Secure the lathe/mill to the floor, but **DO NOT** over-tighten the fasteners.
10. Recheck the ways to make sure the ways are still level, re-shim as required.

⚠ WARNING



The MODEL M1109 weighs approximately 1200 lbs. You will need power lifting equipment and assistance to remove this machine from the pallet and position it. Inspect all lifting equipment and make sure that all is in perfect working order and is rated for the load before attempting to lift and move this lathe/mill. Ignoring this warning may lead to serious personal injury or death.

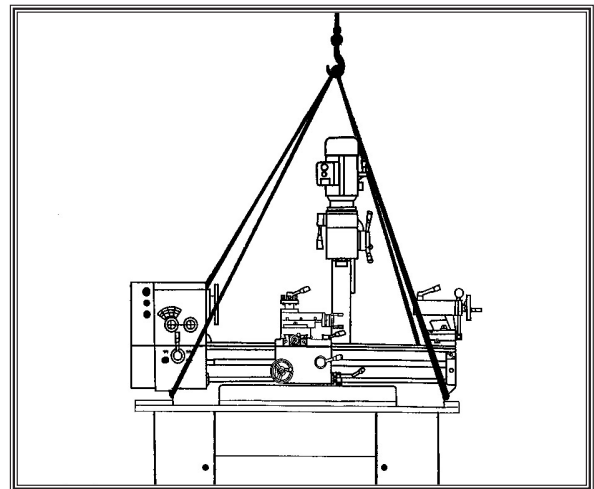


Figure 10. Lifting strap locations.

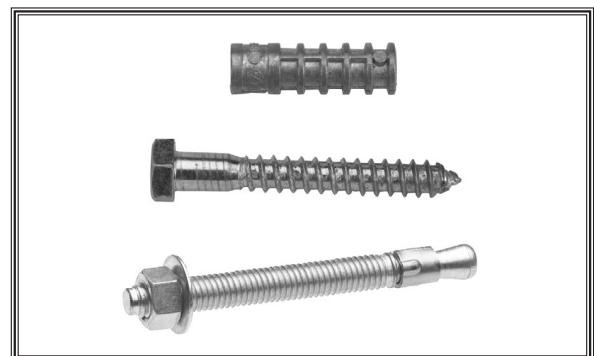


Figure 11. Floor fasteners.

SETUP

Test Run and Break-In

The purpose of the test run is to make sure the lathe/mill and safety features operate correctly before proceeding with additional setup.

To begin the test run procedure, do these steps:

1. Make sure the lathe/mill is lubricated and headstock oil level is full. Refer to **Page 34** if required.
2. Make sure the chuck is bolted to the spindle.
3. Move the spindle speed lever to the 75 RPM position, the range lever to the red-dot position, and the lead screw lever to the neutral position as shown in **Figure 12**.
4. Rotate the red emergency stop button (**Figure 12**) clockwise so it pops to the outward position.
5. Move the half-nut lever upward to disengage the apron, and move the feed lever to the neutral or central position (see **Figure 13**).
6. Move the spindle rotation ON/OFF lever to its central position (**OFF**) as shown in **Figure 13**, and connect the lathe to power so the green lamp is lit.
7. Move the Spindle Rotation ON/OFF lever up or down so the chuck turns, then push the emergency stop button to make sure the lathe stops.
8. Move the Spindle Rotation ON/OFF lever to neutral, reset the red emergency stop button, and use the spindle lever to start the lathe again.
 - If you hear squealing or grinding noises, turn the machine **OFF** immediately and correct any problem before further operation.
 - If the problem is not readily apparent, refer to **Troubleshooting on Page 42**.
9. Let the lathe/mill run for a minimum of 10 minutes.
10. Turn the lathe/mill **OFF**, move levers to the next highest RPM and repeat this step for each RPM setting in Low and High range. **NEVER SHIFT LATHE/MILL GEARS WHEN MACHINE IS OPERATING.**
11. Change the lubricant in the headstock with Mobil DTE® Oil or with an equivalent.

NOTICE

Make sure all power feed levers and dials are disengaged before starting the lathe/mill! Thoroughly familiarize yourself with all the controls and their functions before using any power feed! **NEVER SHIFT LATHE/MILL GEARS WHEN MACHINE IS OPERATING.**

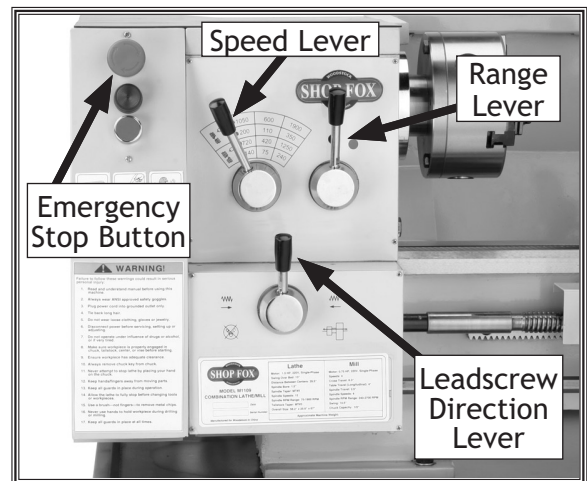


Figure 12. Headstock control levers.

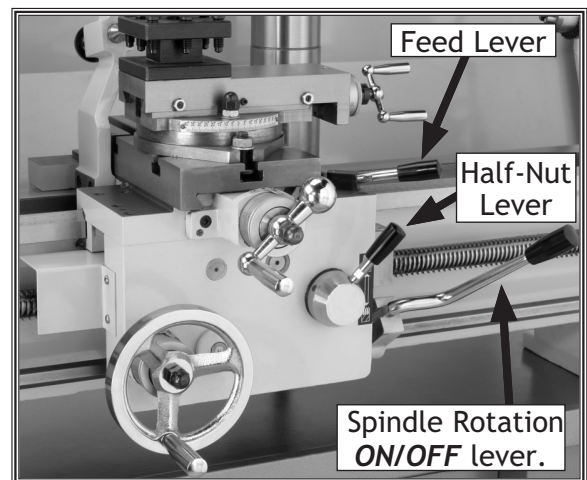


Figure 13. Apron control levers.

LATHE OPERATIONS

General

NOTICE

Complete the **Test Run and Break-In** procedure on **Page 13** before using this lathe/mill for any cutting or threading operations; otherwise, gear box damage will occur.

The Model M1109 will perform many types of operations that are beyond the scope of this manual. Many of these operations can be dangerous or deadly if performed incorrectly.

The instructions in this section are written with the understanding that the operator has the necessary knowledge and skills to operate this machine. **If at any time you are experiencing difficulties performing any operation, stop using the machine!**

If you are an inexperienced operator, we strongly recommend that you read books, trade articles, or seek training from an experienced lathe/mill operator before performing any unfamiliar operations. **Above all, your safety should come first!**

Power Supply

When illuminated, the power lamp (Figure 14) indicates that the power is being supplied to the lathe/mill. If you press the red emergency stop button, you will cut power for machine operations. Twisting the emergency stop button clockwise and letting it pop out will restore power for machine operations and reset the switch.

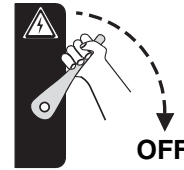
Note: The *Spindle Rotation ON/OFF Lever (Figure 13)* on the apron starts the spindle motor in a particular direction.

! WARNING



Always wear safety glasses when operating this lathe/mill. Failure to comply may result in serious eye injury causing blindness.

! WARNING



TURN OFF and LOCK your master power switch so no power is available to the lathe/mill, and make sure the spindle is stopped before proceeding with any adjustments or maintenance. Failure to comply may result in serious personal injury or death.

OPERATIONS

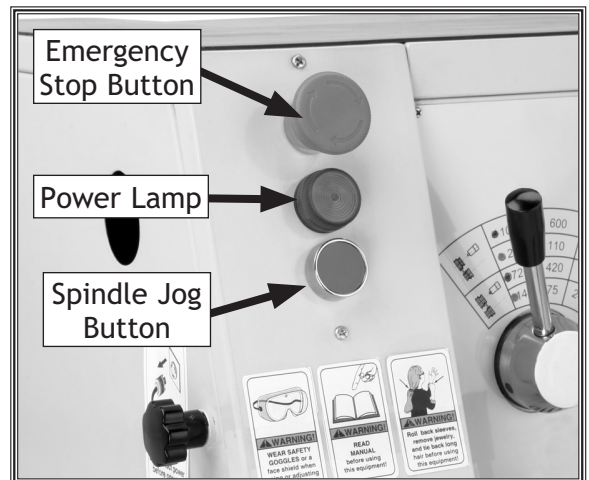


Figure 14. Power lamp and emergency stop location.

Chuck and Faceplate Mounting

The three-jaw scroll chuck has hardened steel jaws that self-center the workpiece within 0.002"-0.003". An extra set of jaws is included for machining larger workpieces.

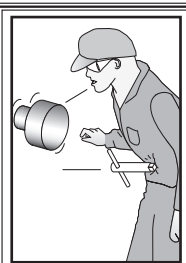
The four-jaw chuck also has hardened steel jaws but are adjusted independently to hold an off-center workpiece. Each jaw can be removed from the chuck body and reversed for special clamping applications.

The cast-iron faceplate has slots for T-bolts that hold clamping fixtures. This face plate and aftermarket clamping hardware will hold non-cylindrical parts such as castings for many types of turning operations.

Both chucks and the faceplate are removed and installed the same way.

To remove and install the chuck or face plate, do these steps:

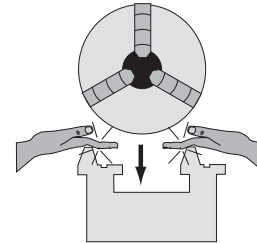
1. DISCONNECT POWER TO THE LATHE/MILL!
2. Lay a chuck cradle or protective layer of plywood over the bedways to prevent your fingers from being pinched and to protect the precision-ground surfaces (see Figure 15).
3. Use a 14mm wrench and loosen the three hex bolts that secure the chuck to the spindle Figure 16.
4. Support the chuck, and while anticipating the heavy weight of the chuck, remove the three hex bolts and then the chuck.
5. Clean the mating surfaces of the spindle and the new chuck or faceplate with a clean oiled rag.
6. Position the other chuck or faceplate on the spindle flange making sure it is fully seated, and tighten the hex bolts in several alternating sequences.



! WARNING

Securely clamp your workpiece and remove the chuck key! Thrown objects from a lathe/mill can cause serious injury or death to the operator and to bystanders many feet away.

! WARNING



PINCH HAZARD! Protect your hands and precision ground bedways with plywood when removing lathe/mill chuck! The heavy weight of a falling chuck can cause serious injury.

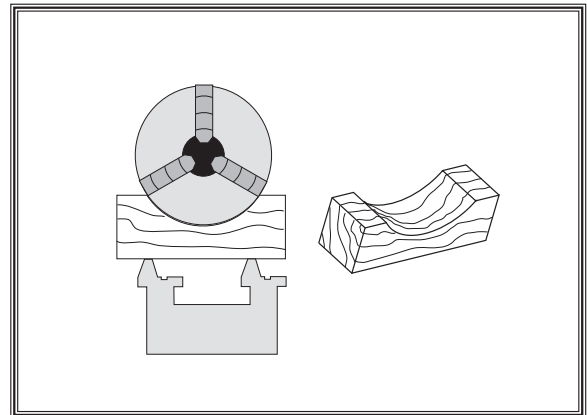


Figure 15. Simple chuck cradle made of scrap lumber.



Figure 16. Chuck, hex bolts, and spindle flange.

Replacing Jaws

The three-jaw scroll chuck has removable hardened steel jaws (Figure 17). The outside of the jaws are used to hold the workpiece from the outer diameter.

Numbered from 1-3, the jaws must be used in the matching numbered jaw guides, see Figure 18.

Note: The chuck need not be removed from the spindle to swap the jaws.

To remove a set of jaws, do these steps:

1. DISCONNECT POWER TO THE LATHE/MILL!
2. Place a piece of wood over the ways to protect them from potential damage.
3. Turn the chuck key counterclockwise and back the jaws out.
4. Clean the jaw mating surfaces and apply a film of white lithium grease to the mating surfaces.
5. Set the old jaws aside in a safe place free of moisture and abrasives.
6. Rotate the chuck key clockwise until you see the tip of the scroll-gear lead thread just begin to enter jaw guide #1 (see Figure 19).
7. Insert jaw #1 into jaw guide #1 and hold the jaw against the scroll gear.
8. Rotate the chuck key clockwise one turn to engage the tip of the scroll-gear lead thread into the jaw. Pull on the jaw now and it should be locked into the jaw guide.
9. Repeat the steps on the remaining jaws.
 - If installed correctly, all three jaws will converge together at the center of the chuck.
 - If the jaws do not come together, repeat this procedure until they do.

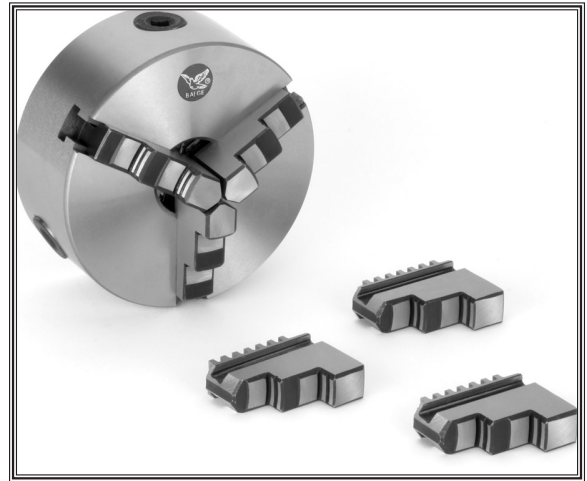


Figure 17. Chuck and jaw selection.

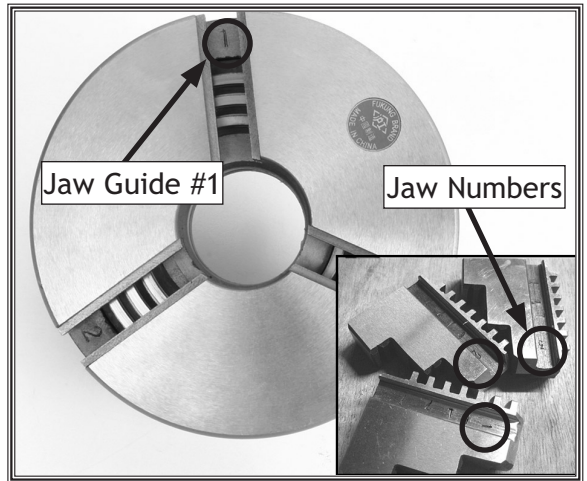


Figure 18. Jaw guide number.



Figure 19. Lead thread on scroll gear.

Using the Four-Jaw Chuck

To install the four-jaw chuck, do these steps:

Refer to the **Three-Jaw Direct Mount Scroll Chuck** procedures on **Page 15** to mount the four-jaw chuck.

To load a workpiece in the four-jaw chuck, do these steps:

1. Using the chuck key, open each jaw so the workpiece will lay flat against the chuck face.
2. Support the workpiece.
3. Lock the tailstock and then turn the tailstock quill so the dead center makes contact or is close to the center point of your workpiece (see **Figure 20**).
4. Turn each jaw until it just makes contact with the workpiece.
5. In an opposing pattern, tighten each jaw in small increments. After you have adjusted the first jaw, continue tightening the opposing jaw. Check the dead center alignment frequently to make sure you have not wandered off your index point due to applying too much pressure to a single jaw.
6. After the workpiece is held in place, back the tailstock away and rotate the chuck by hand. The center point will move if the workpiece is out of center.
7. Make fine adjustments by slightly loosening one jaw and tightening the opposing jaw until the workpiece is precisely aligned. Use a dial indicator for fine tuning adjustments in alignment (see **Figure 21**).
8. Use a lower RPM when machining heavy eccentric workpieces.

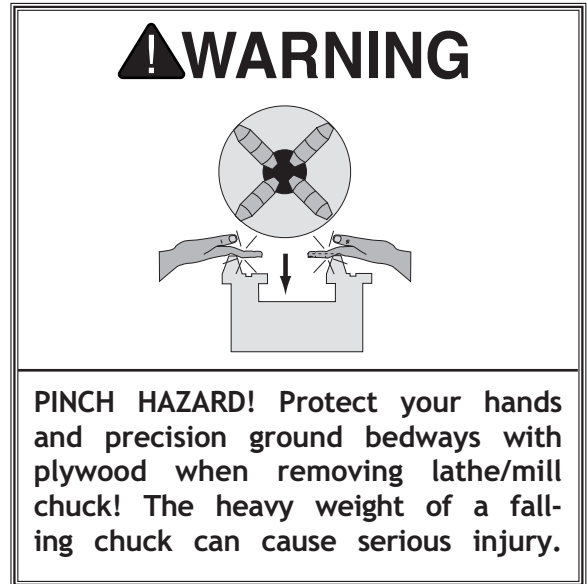


Figure 20. Clamping workpiece.

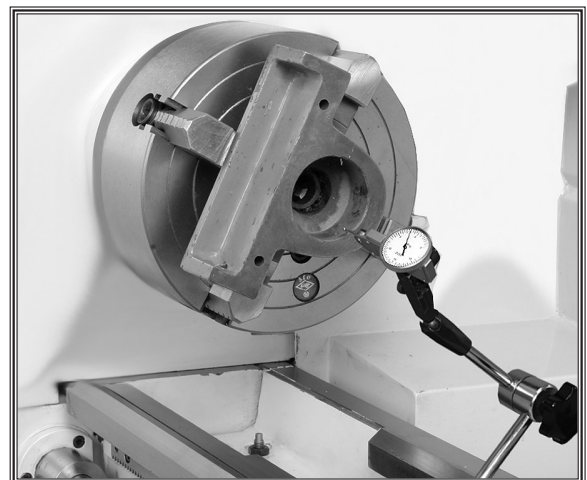
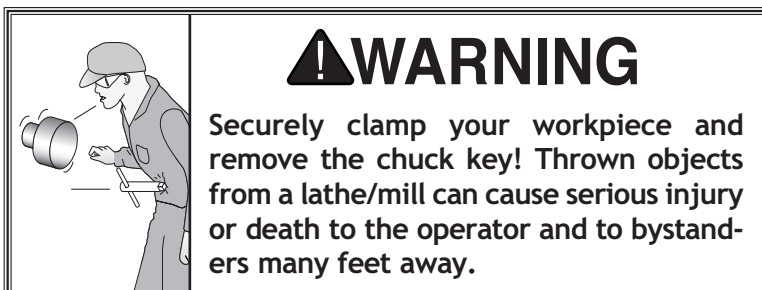


Figure 21. Centering workpiece.



Using the Faceplate

The faceplate can be used to turn non-cylindrical parts or for off-center turning by clamping the workpiece to the faceplate.

To install the faceplate, do these steps:

Refer to the **Three-Jaw Direct Mount Scroll Chuck** procedures on **Page 15** to mount the faceplate.

To load a workpiece, do these steps:

1. Support the workpiece.
2. Slide the tailstock to the workpiece.
3. Lock the tailstock and then turn the tailstock quill so the dead center makes contact with the center point of your workpiece.
4. Lock the tailstock quill when sufficient pressure is applied to hold the workpiece in place.

Note: Depending on the workpiece, some additional support may be needed.

5. Secure the workpiece with a minimum of three independent clamping devices. Failure to follow this step may lead to deadly injury to yourself or bystanders. Take into account rotation and the cutting forces applied to the workpiece when clamping to the faceplate. **Make sure your clamping application will not fail!**
6. Use a lower RPM when machining heavy eccentric workpieces.

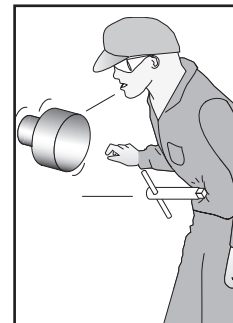


Figure 22. Faceplate installed.

WARNING

Use a minimum of three independent clamping devices when turning eccentric workpieces. Failure to provide adequate clamping will cause workpiece to eject.

WARNING



Securely clamp your workpiece and remove the chuck key! Thrown objects from a lathe/mill can cause serious injury or death to the operator and to bystanders many feet away.

Using the Tailstock

The tailstock (Figure 23) can be used to support workpieces with the use of a live or dead center. Using an MT#3 drill chuck and a drill bit, the lathe can drill or bore holes in the center of a part. The tailstock can also be offset for cutting shallow tapers.

To use the tailstock, do these steps:

1. Slide the tailstock to the desired position.
2. Pull up on the tailstock lock lever to lock the tailstock in place on the ways.
3. With the tailstock locked, push down the quill lock lever to unlock.
4. Turn the quill feed handle clockwise to feed/move the quill towards the spindle, or counterclockwise to move away from the spindle.
5. Turn the quill lock lever to lock the quill in place.

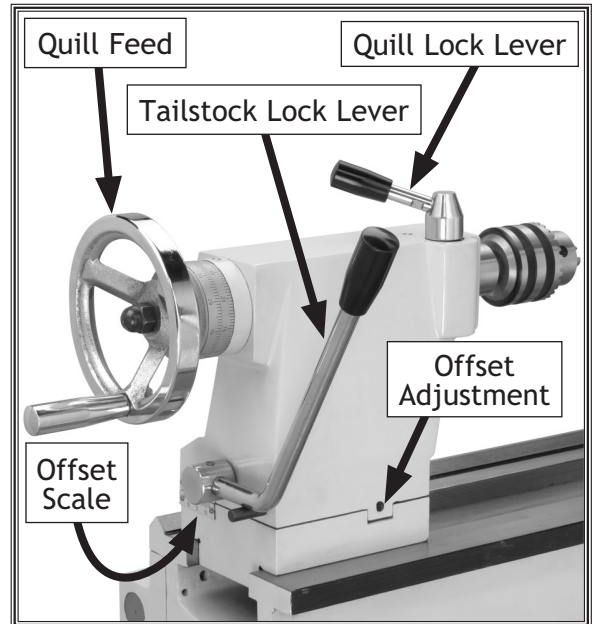


Figure 23. Tailstock and quill lock handles in locked position.

Drilling with the Tailstock

To install the MT#3 drill chuck, do these steps:

1. With the tailstock locked, unlock the quill lock lever.
2. Turn the quill feed handle clockwise to extend the quill about one inch.
3. Insert the MT#3 chuck (Figure 24) or an MT#3 tapered drill shank into the quill until the taper is firmly seated.
4. Turn the quill feed handle clockwise to feed the drill bit into a rotating workpiece.
5. To remove the chuck taper, turn the quill feed handle counterclockwise until the chuck is pushed out of the tailstock taper.

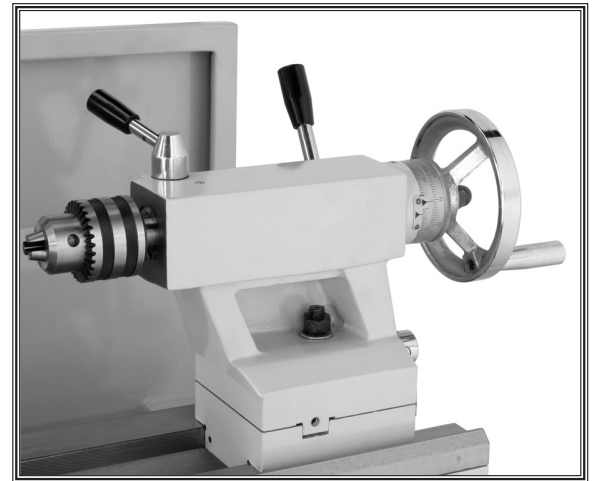


Figure 24. Setting up tailstock for drilling.

Cutting Shallow Tapers with the Tailstock

To setup the tailstock to cut tapers, do these steps:

1. Lock the tailstock in position.
2. Alternately loosen and tighten the left and right offset adjustment screws until the desired offset is indicated on the scale (see Figures 25 & 26).
3. Retighten the lock screw.

Note: To return the tailstock back to the original position, repeat the process until the centered position is indicated on the scale.

Tailstock Alignment

The tailstock is aligned at the factory with the headstock. We recommend that you take the time to ensure that the tailstock is aligned to your own desired tolerances.

To align the tailstock, do these steps:

1. Using a precision level on the bedways, make sure the lathe/mill is level side-to-side and front-to-back. If the lathe/mill is not level, correct this condition before proceeding.
2. Get two pieces of steel round stock, two inches in diameter and six inches long.
3. Center drill both ends of one piece of the round stock. Set it aside for use in **Step 6**.
4. Using the other piece of stock, make a dead center by turning a shoulder to make a shank. Flip the piece over in the chuck and turn a 60° point (see **Figure 27**).

Note: As long as the dead center remains in the chuck, the point of your center will remain true to the spindle axis. Keep in mind that the point will have to be refinished whenever it is removed and returned to the chuck.

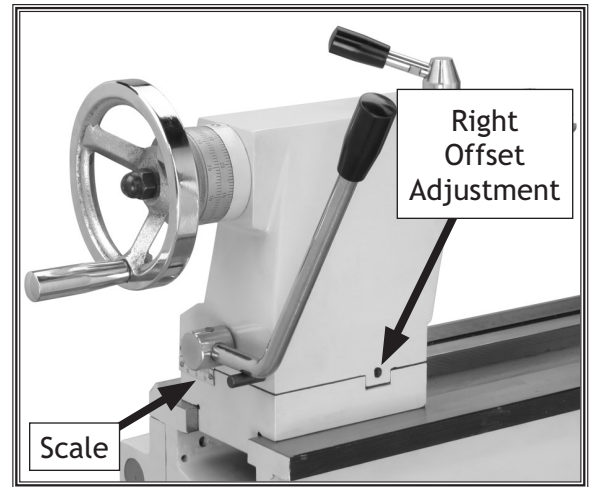


Figure 25. Right offset adjustment.

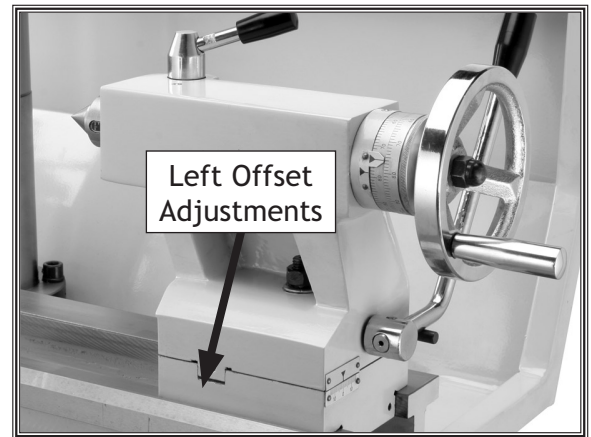


Figure 26. Left offset adjustment.

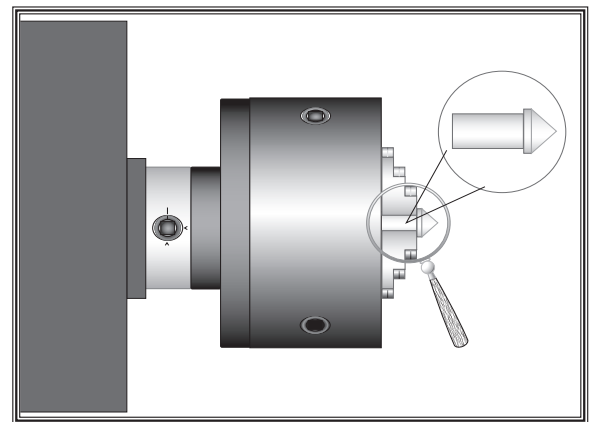


Figure 27. Tailstock centering dead center.

5. Place the live center in the tailstock.
6. Attach a lathe/mill dog to the bar stock and mount it between centers.
7. Turn approximately 0.010" off the diameter.
8. Measure the stock with a micrometer.
 - If the stock diameter is thicker at the tailstock end, the tailstock needs to be moved toward you half the distance of the amount of the taper (see **Figure 28**).
 - If the stock diameter is thinner at the tailstock end, the tailstock needs to be moved away from you half the distance of the amount of the taper (see **Figure 29**).
9. Mount a dial indicator so the dial plunger is on the tailstock barrel before making adjustments to the tailstock.
10. Turn another 0.010" off of the diameter and check for a taper. Repeat this process as necessary until the desired amount of accuracy is achieved.

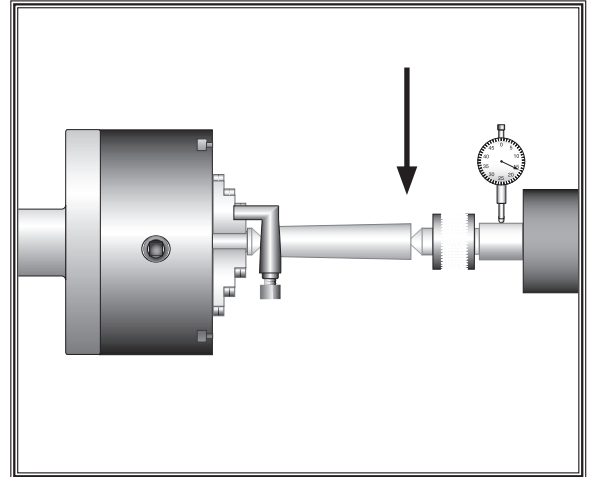


Figure 28. Tailstock adjustment option #1.

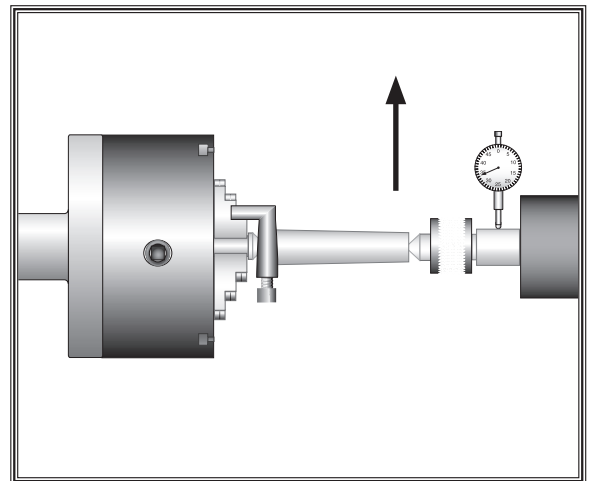


Figure 29. Tailstock adjustment option #2.

Using Centers

The dead center is used in the tailstock and lathe spindle to support workpieces. When used in the tailstock, make sure to keep the MT#3 dead center tip and workpiece lubricated to prevent tip galling.

This lathe/mill is also supplied with an MT#5 dead center that fits into the lathe spindle taper.

To install a dead or live center, do these steps:

1. Feed the quill out about 1" and insert the MT#3 dead center (Figure 30). The mating tapers provide the locking action.
2. Move the tailstock into position and lock in place.
3. Feed the quill into the workpiece.

Note: Make sure there is a center drilled hole in the end of the workpiece for the dead center.

4. Lock the quill into place once the live center and the part rotate together. The quill may need to be adjusted during operation.
5. To remove the dead center, retract the quill until the dead center pops free.

To install the MT#5 dead center in the spindle, do these steps:

1. Remove the chuck from the spindle.
2. Install the MT#5 dead center in the spindle.
3. Attach the faceplate to the spindle.

Note: When using the dead center in the spindle, use a lathe dog so that your part will rotate with the spindle and not spin on the dead center tip.



Figure 30. Inserting dead center.



Figure 31. Faceplate and dead center setup.

NOTICE

Failure to keep dead center point well lubricated will gall the dead center and workpiece.

Using the Steady Rest

The steady rest serves as a support for long shafts. The steady rest can be placed anywhere along the length of the ways.

To use the steady rest, do these steps:

1. Carefully place the steady rest on the lathe bedways.
2. Loosen the lock knobs so the finger position can be adjusted (see **Figure 32**).
3. Loosen the clamp knob (see **Figure 32**) and open the steady rest so a workpiece can fit inside of the fingers.
4. Position the steady rest where desired. Tighten the lock nut (see **Figure 32**) at the base of the steady rest to secure in place.
5. Close the steady rest so that the workpiece is inside the fingers and tighten the clamp knob.
6. Turn the adjustment knobs so the fingers are snug against the workpiece and then tighten the lock knobs. Lubricate the finger tips with an anti-seize lubricant during operation.
7. After prolonged use, the fingers will show wear. Either mill or file the tips for a new contact surface.

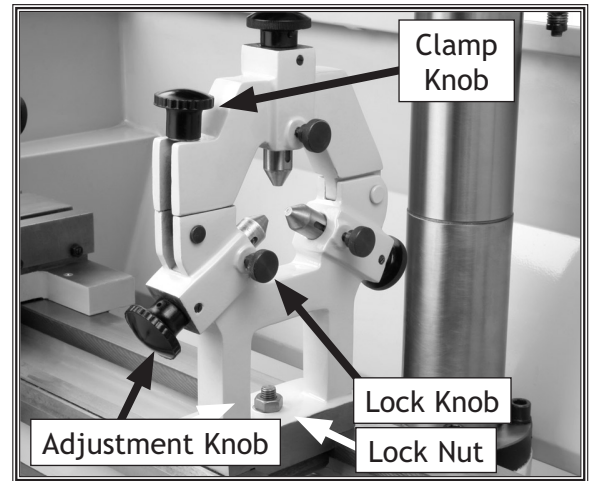


Figure 32. Steady rest adjustments.

Using the Follow Rest

The follow rest in **Figure 33** is mounted on the saddle and follows the movement of the tool. The follow rest requires only two fingers, as the cutting tool acts as the third. The follow rest is used on long, slender parts to prevent flexing of the workpiece from the pressure of the cutting tool.

The sliding fingers are set similar to those of the steady rest—free of play but not binding. Always lubricate during operation. After prolonged use, the fingers will need to be milled or filed to clean up the contact surface.

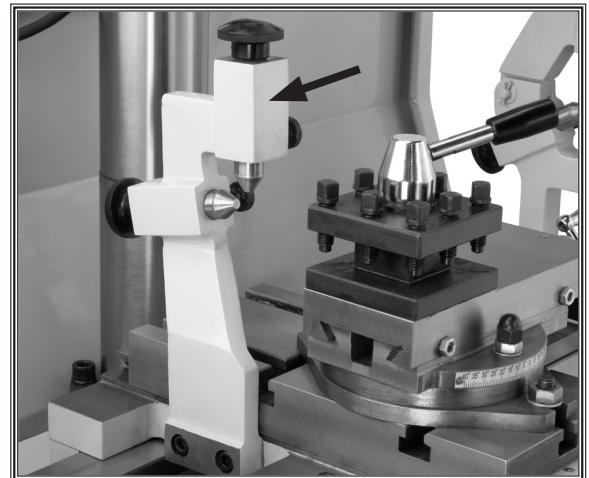


Figure 33. Follow rest attachment.

Setting Compound Slide

The compound slide is used to cut tapers on parts or to set the proper infeed angle when threading. It may also be used to cut specific lengths longitudinally, when set parallel to the spindle axis.

To set the angular position, do these steps:

1. Loosen the hex nuts, one on each side of the compound slide (see **Figure 34**).
2. Rotate the compound slide to the desired angular position using the scale.
3. Tighten the two hex nuts. Be sure to not overtighten, as you may strip threads or crack or distort the base casting.

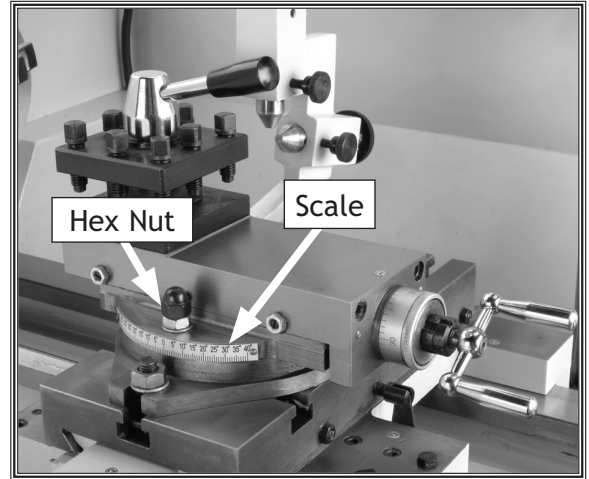


Figure 34. Compound slide, scale, and handwheel.

Using the Tool Post

The four-way tool post (**Figure 35**) is mounted on top of the compound slide, and allows a maximum of four tools to be loaded simultaneously.

The four-way tool post allows for quick indexing to new tools. This is accomplished by rotating the top handle counterclockwise and then rotating the tool post to the desired position. Rotate the top handle clockwise to lock the tool into position.

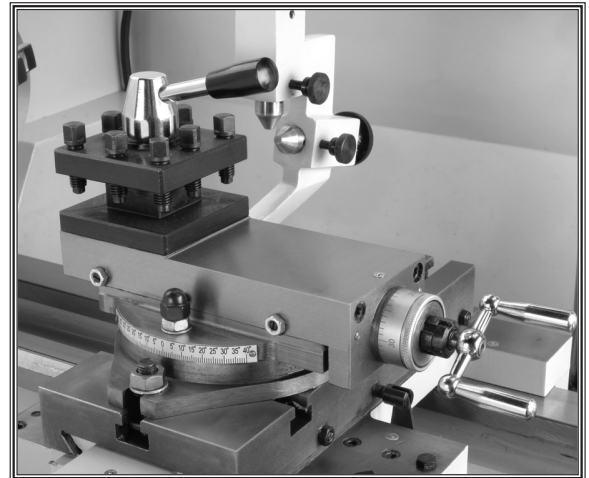


Figure 35. Four-way tool post.

Using Manual Feed

You can manually move the cutting tool around the lathe/mill with the three handwheels shown in **Figure 36**.

Longitudinal Handwheel

The longitudinal handwheel moves the carriage left or right along the bed. This control is helpful when setting up the machine for turning or when manual movement is desired during turning operations.

Cross Feed Handwheel

The cross slide handwheel moves the top slide toward and away from the work. Turning the dial clockwise moves the slide toward the workpiece.

Compound Slide Handwheel

The compound slide handwheel controls the position of the cutting tool relative to the workpiece. The graduated dial is adjustable using the same method as the dial on the cross slide. Angle adjustment is held by two hex nuts on the base of the compound slide.

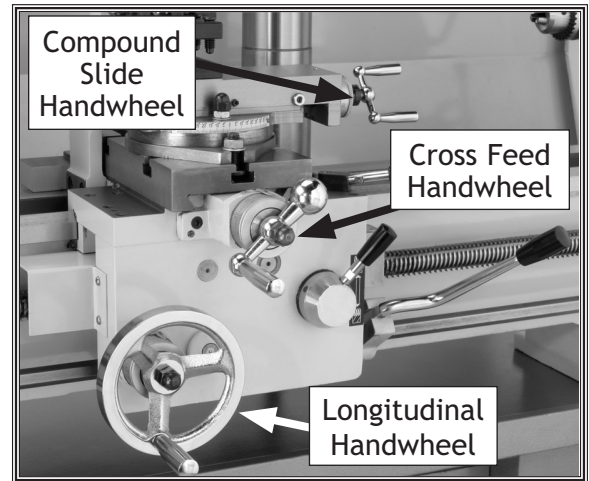


Figure 36. Carriage controls.

Setting RPM

To determine and set the needed cutting RPM, do these steps:

1. Use the table in **Figure 37** to determine the cutting speed required for the workpiece material.
2. Determine the average final diameter of the workpiece in inches, for the cut to be made.

⚠ WARNING

Failure to follow RPM and feed rate guidelines may threaten operator safety from ejected parts or broken tools.

3. Now use the following formula to determine the closest RPM for the cutting operation:

$$\frac{(\text{Cutting Speed} \times 4)}{\text{Diameter of Cut}} = \text{RPM}$$

4. With the calculated RPM, decide on the closest cutting RPM to what you need.
5. Make sure the spindle is completely stopped before proceeding.
6. Move the levers (**Figure 38**) to get the RPM range that is closest to your calculated RPM:
 - The range lever selects BLACK DOT = High or RED DOT = Low.
 - The RPM Lever selects the RPM within that range.

Note: You may need to rotate the chuck by hand to get the gears to engage.

Workpiece Material	Cutting Speed (sfm)
Aluminum & alloys	300
Brass & Bronze	150
Copper	100
Cast Iron, soft	80
Cast Iron, hard	50
Mild Steel	90
Cast Steel	80
Alloy Steel, hard	40
Tool Steel	50
Stainless Steel	60
Titanium	50
Plastics	300-800
Wood	300-500

Note: For carbide cutting tools, double the cutting speed. These values are a guideline only. Refer to the MACHINERY'S HANDBOOK for more detailed information.

Figure 37. Cutting speed table for HSS cutting tools.

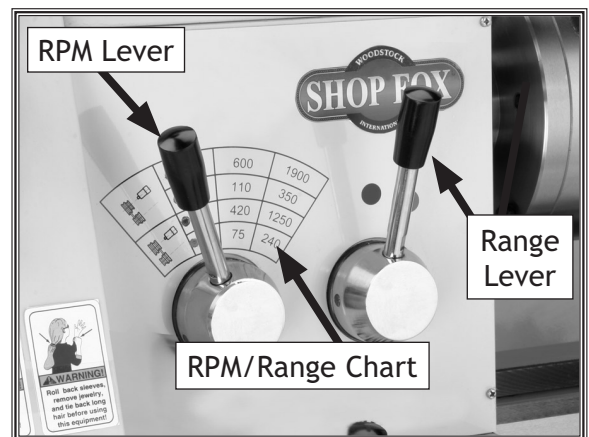


Figure 38. Spindle speed selector levers.

Setting Power Feed Rate

The carriage has longitudinal and cross slide power feed capabilities. All directions reverse when spindle rotation is reversed.

NOTICE

Feed rate is based on spindle RPM. High feed rates combined with high spindle speeds result in a rapidly moving carriage or cross slide. Pay close attention to the feed rate you have chosen and be ready to disengage the apron. Failure to do this may cause the carriage to crash into the chuck.

To set and engage the power feed, do these steps:

1. DISCONNECT THE LATHE/MILL FROM POWER!
2. Refer to the **Change Gear Chart** on **Page 29**, or the chart on the inside of the change gear door to determine the needed combination of gears and which spindle location to install each gear on.

See **Figure 39** for the gear installation locations on the lathe that are referenced by the chart.

See **Figure 40** for examples of how certain gear combinations can achieve your needed longitudinal and cross feed rates. For example: The chart shows that 0.0089" of longitudinal travel per revolution of lead screw is needed, or 0.0019" of cross travel per revolution of lead screw is needed.

Note: All change gears are stamped with the number of teeth they have.

3. Loosen the lash adjuster (**Figure 39**) and swing the assembly out of the way.
4. Remove the required E-clips, lubricate, and swap out the appropriate change gears.
5. Move the lash adjuster so the gear backlash is at 0.003" to 0.008", and tighten the lock nut.
6. Use the leadscrew lever to select leadscrew rotation direction (**Figure 41**).
7. Loosen the apron lock bolt, and use the feed lever (**Figure 41**) to engage the cross feed or longitudinal feed.

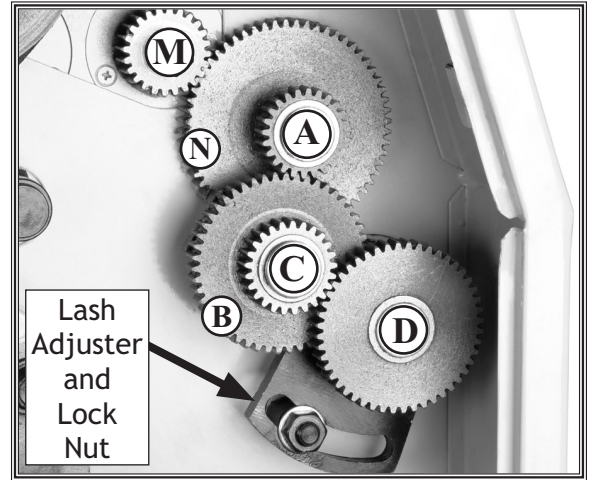


Figure 39. Change gear locations.

		Inch Threading		Longitudinal Feed		Cross Feed	
M	N	A/B	C/D	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$
M = 24	M = 28						
N = 60	N = 35						
10	5	$\frac{24}{60} \times \frac{25}{48}$	$\frac{30}{32}$	0.0040	0.0080	0.008	0.001
12	6	$\frac{48}{36} \times \frac{30}{32}$	$\frac{30}{32}$	0.0206	0.0412	0.044	0.008
16	8	$\frac{40}{36} \times \frac{30}{32}$	$\frac{30}{32}$	0.0172	0.0344	0.036	0.007
18	9	$\frac{35}{28} \times \frac{30}{48}$	$\frac{30}{48}$	0.0130	0.0260	0.028	0.005
20	10	$\frac{30}{32} \times \frac{25}{48}$	$\frac{30}{48}$	0.0115	0.0230	0.024	0.004
22	11	$\frac{32}{25} \times \frac{25}{48}$	$\frac{25}{32}$	0.0094	0.0188	0.020	0.004
23	11.5	$\frac{25}{32} \times \frac{32}{48}$	$\frac{32}{48}$	0.0089	0.0178	0.019	0.003
24	12	$\frac{25}{32} \times \frac{32}{48}$	$\frac{32}{48}$	0.0086	0.0172	0.018	0.003
25	12.5	$\frac{40}{32} \times \frac{32}{60}$	$\frac{32}{50}$	0.0082	0.0164	0.0175	0.003
26	13	$\frac{25}{32} \times \frac{32}{50}$	$\frac{32}{50}$	0.0079	0.0158	0.017	0.003
28	14	$\frac{25}{30} \times \frac{30}{48}$	$\frac{30}{48}$	0.0074	0.0148	0.016	0.003
30	15	$\frac{24}{36} \times \frac{30}{48}$	$\frac{30}{48}$	0.0069	0.0138	0.015	0.003
32	16	$\frac{25}{40} \times \frac{30}{48}$	$\frac{30}{48}$	0.0065	0.0130	0.014	0.002
34	17	$\frac{25}{34} \times \frac{24}{48}$	$\frac{24}{48}$	0.0061	0.0122	0.013	0.002
36	18	$\frac{25}{36} \times \frac{24}{48}$	$\frac{24}{48}$	0.0057	0.0114	0.012	0.002

Figure 40. Using the change gear chart.

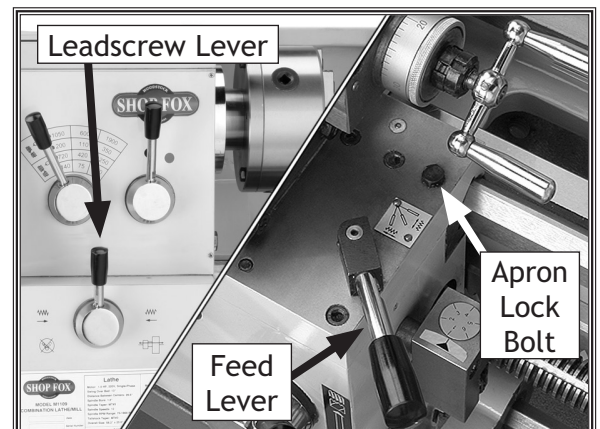


Figure 41. Leadscrew and feed levers.

OPERATIONS

Threading Setup

Your lathe is capable of cutting inch and metric threads.

To setup for threading, do these steps:

1. DISCONNECT THE LATHE/MILL FROM POWER!
2. Refer to the **Change Gear Chart** on **Page 29** or the chart on the inside of the change gear door to determine the needed combination of gears and which spindle location to install each gear on.

See **Figure 42** for examples of how gear combinations can achieve your needed threading rate. For example: The chart shows that 24 TPI is needed.

Note: All change gears are stamped with the number of teeth they have.

3. Loosen the lash adjuster (**Figure 39**) and swing the assembly out of the way.
4. Remove the required E-clips, lubricate, and swap out the appropriate change gears.
5. Move the lash adjuster so the gear backlash is at 0.003" to 0.008", and tighten the lock nut.
6. Use the leadscrew lever to select leadscrew direction (**Figure 43**).
7. Setup the cutting tool, compound rest, and cross slide to cut your threads; and loosen the apron lock (**Figure 41**).

- If cutting inch threads, refer to the **Thread Dial Table** in **Figure 44** to use the thread dial.
- If cutting metric threads, do not use the thread dial. Instead, you must leave the half nut engaged until the threading operation is totally complete.

8. Loosen the apron lock bolt and use the feed lever (**Figure 41**).
9. While threading, keep your hand on the half-nut lever, ready to disengage the apron to avoid any potential for an apron/chuck crash.

Inch Threading		Longitudinal Cross Feed	
M	N	Feed	Feed
M=24	M=28		
N=60	N=35		
24	25	0.0040	0.0080
50	48	0.0206	0.0044
36	30	0.0172	0.0344
40	32	0.0130	0.0260
36	32	0.0115	0.0230
28	48	0.0103	0.0206
32	30	0.0094	0.0188
32	44	0.0089	0.0178
24	32	0.0086	0.0172
25	45	0.0082	0.0164
32	50	0.0079	0.0158
32	52	0.0074	0.0148
24	30	0.0069	0.0138
36	48	0.0065	0.0130
40	30	0.0061	0.0122
34	48	0.0057	0.0114
25	24	0.0053	0.0106

Figure 42. Using the change gear chart.

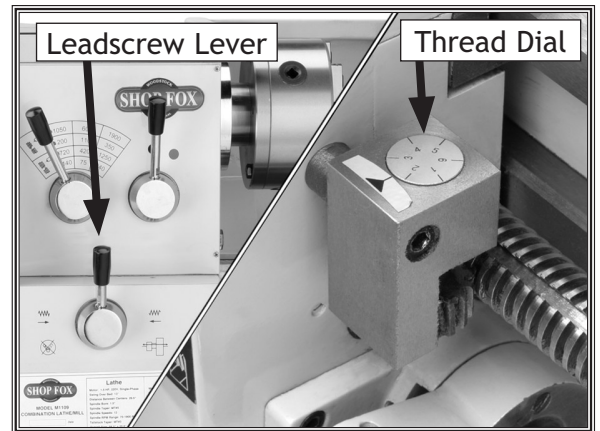


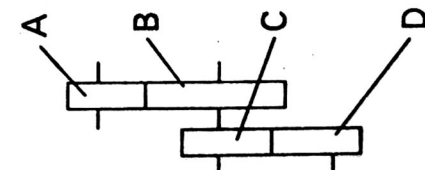
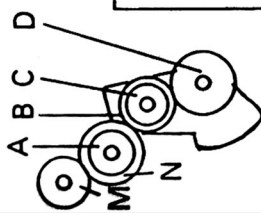
Figure 43. Threading controls.

THREAD DIAL TABLE			
LEAD SCREW PITCH 5 T.P.I.			
T.P.I.	DIAL	T.P.I.	DIAL
5	1-6	18	1 or 2
6	1 or 2	20	
7	1	22	1 or 2
8	1	23	1
9	1	24	1 or 2
10	1-6	25	1-6
11	1	26	1 or 2
11.5		28	1 or 2
12	1 or 2	30	1-6
12.5		32	1 or 2
13	1	34	1 or 2
14	1 or 2	36	1 or 2
15	1-6	40	1-6
16	1 or 2	48	1 or 2
17	1		

Figure 44. Thread dial table.

Change Gear Chart

M = 24		M = 28		A B	X	C D	" "		" "		mm	
M = 24	N = 60	M = 28	N = 35				M = 24	N = 60	M = 28	N = 35		M = 24
10	5	0.0040	0.0080	0.0206	0.0412	0.0044	0.0088	0.0040	0.0080	0.0044	0.0088	0.0017
12	6	0.0172	0.0344	0.0172	0.0344	0.0036	0.0072	0.0036	0.0072	0.0036	0.0072	0.0022
16	8	0.0130	0.0260	0.0130	0.0260	0.0028	0.0056	0.0028	0.0056	0.0028	0.0056	0.0018
18	9	0.0115	0.0230	0.0115	0.0230	0.0024	0.0048	0.0024	0.0048	0.0024	0.0048	0.0016
20	10	0.0103	0.0206	0.0103	0.0206	0.0022	0.0044	0.0022	0.0044	0.0022	0.0044	0.0015
22	11	0.0094	0.0188	0.0094	0.0188	0.0020	0.0040	0.0020	0.0040	0.0020	0.0040	0.0014
23	11.5	0.0089	0.0178	0.0089	0.0178	0.0019	0.0038	0.0019	0.0038	0.0019	0.0038	0.0013
24	12	0.0086	0.0172	0.0086	0.0172	0.0018	0.0036	0.0018	0.0036	0.0018	0.0036	0.0012
25	12.5	0.0082	0.0164	0.0082	0.0164	0.00175	0.0035	0.00175	0.0035	0.00175	0.0035	0.0011
26	13	0.0079	0.0158	0.0079	0.0158	0.0017	0.0034	0.0017	0.0034	0.0017	0.0034	0.0010
28	14	0.0074	0.0148	0.0074	0.0148	0.0016	0.0032	0.0016	0.0032	0.0016	0.0032	0.0009
30	15	0.0069	0.0138	0.0069	0.0138	0.0015	0.0030	0.0015	0.0030	0.0015	0.0030	0.0008
32	16	0.0065	0.0130	0.0065	0.0130	0.0014	0.0028	0.0014	0.0028	0.0014	0.0028	0.0007
34	17	0.0061	0.0122	0.0061	0.0122	0.0013	0.0026	0.0013	0.0026	0.0013	0.0026	0.0006
36	18	0.0057	0.0114	0.0057	0.0114	0.0012	0.0024	0.0012	0.0024	0.0012	0.0024	0.0005
40	20	0.0052	0.0104	0.0052	0.0104	0.0011	0.0022	0.0011	0.0022	0.0011	0.0022	0.0004
48	24	0.0043	0.0086	0.0043	0.0086	0.0009	0.0018	0.0009	0.0018	0.0009	0.0018	0.0003



MILLING OPERATIONS

Installing Tools

To install a tool in the spindle, do these steps:

1. DISCONNECT THE LATHE/MILL FROM POWER!
2. Carefully clean the surface of the arbor and spindle taper. Ensure that they are free of debris and burrs.
3. Insert the arbor into the spindle, and rotate the arbor so the slot in the arbor lines up with the pin inside of the spindle.
4. Press the arbor up firmly to seat it with the spindle.
5. Finger tighten the drawbar into place (**Figure 45**), then use a 12mm wrench to tighten the drawbar (**Figure 46**).

Note: Overtightening the drawbar makes removal difficult and stretches the threads of the arbor and the drawbar.

6. Clear away all items from the cutting tool before turning the mill ON.



Figure 45. Aligning drawbar with chuck arbor.

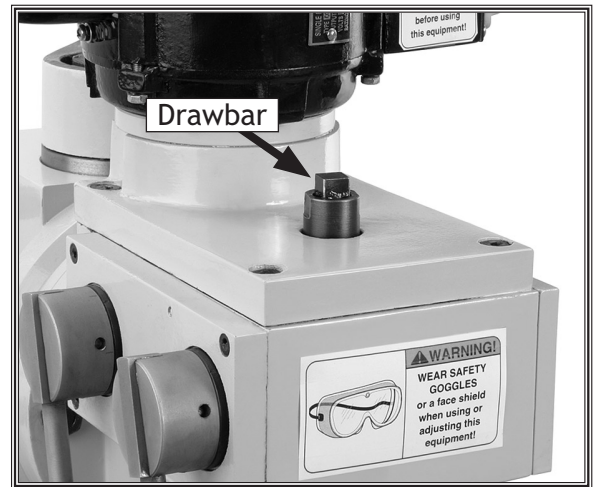


Figure 46. The drawbar.

Removing Tools

To remove a tool from the spindle, do these steps:

1. DISCONNECT THE LATHE/MILL FROM POWER!
2. Return the headstock to the highest position and loosen the drawbar.
3. Put on leather gloves and support the chuck or collet and unthread the drawbar approximately four turns. **DO NOT** completely unscrew the drawbar prior to striking the drawbar or the initial threads of the drawbar and tool will be crushed.
4. Lightly strike the drawbar with a dead blow hammer or a piece of wood to release the arbor from the spindle.
5. Prepare to catch the arbor, and unscrew the drawbar until the arbor drops into your hand.

Headstock Positioning

The mill headstock head can be raised and lowered vertically, or rotated left or right up to 90° degrees to position the cutting tool next to the workpiece.

To position the spindle head vertically, do these steps:

1. Make sure the spindle is stopped and the work area is free from obstructions before proceeding.
2. Loosen both column lock levers so that the headstock can freely slide on the column (**Figure 47**).
3. Rotate the mill height handwheel (**Figure 47**) to raise or lower the headstock to the desired position then lock the levers.
4. While supporting the headstock, use a 17mm wrench and loosen both left and right headstock tilt lock nuts (**Figure 47**), then tilt the headstock to your desired angle. Retighten the lock nuts.

WARNING

The headstock is heavy. Make sure that you support the headstock before you loosen the lock nuts. Ignoring this warning may allow the headstock to uncontrollably swing over to the right or left causing injury or severe lathe/mill damage.

Quill Travel

The quill feed is controlled by the handle on the right of the headstock, and a lock bolt on the left side of the headstock (**Figure 49**).

To use the quill, do these steps:

1. Unlock the quill feed lock bolt to release the quill.
2. For drilling, pull the handle toward you and the quill will feed down toward the workpiece.

Note: The quill feed handle is spring loaded so that it will automatically return to its upmost vertical position. DO NOT let go of the handle at the end of an operation to prevent damage to the quill.

3. For milling, hold the quill at a particular depth and tighten the quill lock bolt.



Figure 47. Headstock lock levers.

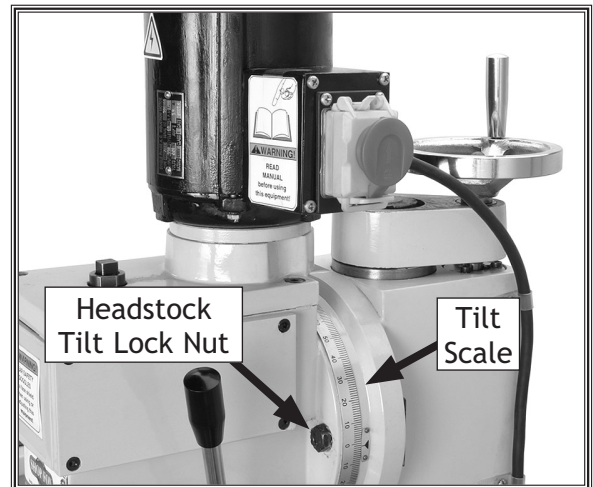


Figure 48. Headstock handle.

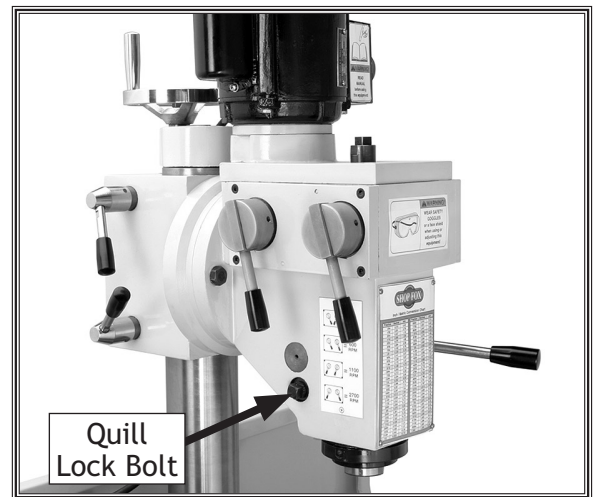


Figure 49. Quill lock.

Table Travel

The mill table of the Model M1109 can be moved in two axes—cross feed and longitudinal feed. Each of these axes are controlled by graduated handwheels to accurately position the workpiece in relation to the tool. To set the power feed for milling, refer to **Setting Power Feed Rate** on **Page 27**.

Cross Feed

The cross feed is controlled by the cross feed handwheel of the lathe shown in **Figure 50**.

Longitudinal Feed Control

The longitudinal feed is controlled by the longitudinal handwheel of the lathe, and the lock at the back of the saddle (see **Figure 50**).

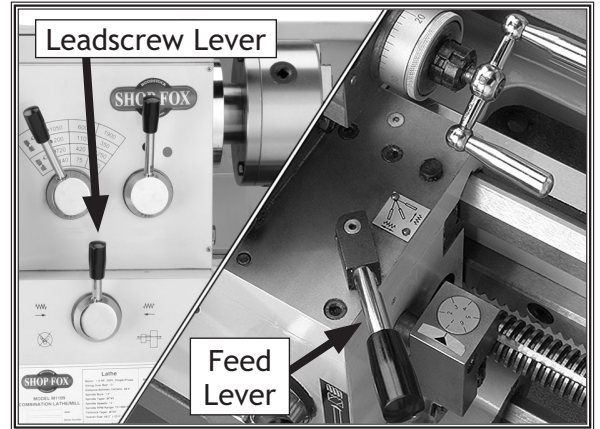


Figure 50. Headstock and apron controls.

Start Up and Spindle Break-in Procedures

It is essential to closely follow the proper break-in procedures to ensure trouble free performance. Complete this process once you have familiarized yourself with all instructions in this manual.

To begin the start up procedure, do these steps:

1. Make sure the mill has been properly lubricated.
2. Make sure there are no obstructions around or underneath the spindle.
3. Set the spindle speed to 240 RPM.
4. Turn the mill **ON** (**Figure 51**).
5. Turn the spindle **ON** and run it a minimum of 10 minutes. Repeat this step on the other three RPM ranges.



Figure 51. Start switch location.



Figure 52. Gearbox and controls.

NOTICE

Failure to follow start up and spindle break-in procedures will cause rapid deterioration of spindle and other related parts, and never shift gears while lathe or mill is running.

Setting RPM

When using the milling machine, determine the RPM needed to cut your workpiece, and adjust the gear change levers to achieve the closest RPM.

NOTICE

Never shift gears while lathe or mill is running; otherwise, the gear teeth will be chipped or broken.

To determine and set the mill to the needed RPM, do these steps:

1. Select the cutting speed required for the material of your workpiece using the table in **Figure 37**.
2. Measure the diameter of your cutting tool in inches.
3. Use the following formula to determine the needed RPM for your operation:

$$(\text{Cutting Speed} \times 4) / \text{Tool Diameter} = \text{RPM}$$

Note: You will only be able to get an approximate RPM value with the variable speed knob.

4. Move the mill gearbox levers to the nearest milling speed RPM.

NOTICE

Failure to follow RPM and Feed Rate Guidelines will put undue strain on moving parts, shorten tool life, poor workpiece results and may threaten operator safety from ejected parts or broken tools.

Cutting Speeds for High Speed Steel (HSS) cutting tools:

Workpiece Material	Cutting Speed (sfm)
Aluminum & alloys	300
Brass & Bronze	150
Copper	100
Cast Iron, soft	80
Cast Iron, hard	50
Mild Steel	90
Cast Steel	80
Alloy Steel, hard	40
Tool Steel	50
Stainless Steel	60
Titanium	50
Plastics	300-800
Wood	300-500

Figure 37. High speed steel cutting chart.

Note: Double the cutting speed for carbide cutting tools. These values are a guideline only. Refer to the MACHINERY'S HANDBOOK for more detailed information.

MAINTENANCE

General Maintenance

Regular periodic maintenance of your lathe/mill will ensure optimum performance. Make a habit of inspecting your machine each time you use it.

Check for the following conditions and repair or replace when necessary:

- Loose mounting bolts and chuck.
- Worn switch or safety features.
- Worn or damaged cords and plugs.
- Any other condition that could hamper the safe operation of this machine.

General Cleaning

Clean your machine every day or more often as needed. Make sure to unplug the lathe/mill before cleaning it. Never blow the lathe/mill off with compressed air, otherwise you will force metal shavings deep into mechanisms. Remove chips as they accumulate with rags, brushes, and a shop vacuum. Chips left on the machine soaked with water-based coolant will eventually invite oxidation and a gummy residue build up around moving parts. Cleaning will help keep your lathe/mill running smoothly. Always be safe and responsible with the use and disposal of cleaning products.

Never use acetone, gasoline, or lacquer thinner to remove stains or oil from painted surfaces. These chemicals will melt the paint. Use mineral spirits or mild household degreasers.

General Lubrication

Keep the headstock oil level at $\frac{3}{4}$ full (Figure 54). After break-in, change the oil in the headstock with Mobil® DTE® Heavy-Medium or an equivalent grade of oil immediately and then again after three months. After that, change the oil at the same time on an annual basis or more frequently if extreme machine use requires it.

To control surface rust on machined surfaces, wipe the unprotected metal as required with a rust inhibiting oil.

Paint all gears in Figure 55 with a good quality automotive wheel bearing grease as required to keep lubricated.



Figure 53. Headstock fill plug.



Figure 54. Headstock oil level sight glass.

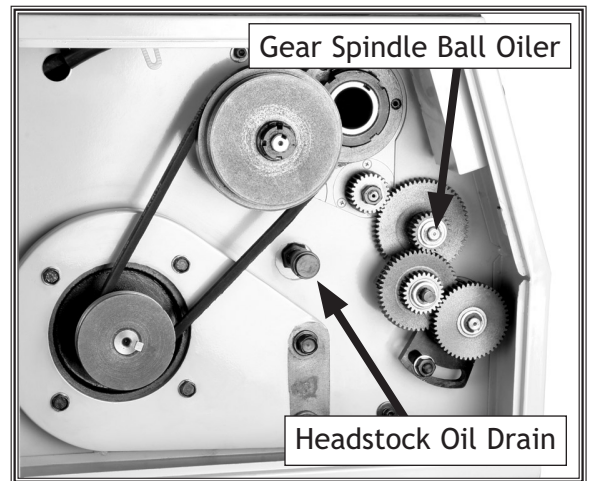


Figure 55. Headstock and gear box drain locations.

For daily lubrication, use a manual oil gun with a general 10W machine oil to lubricate the following 15 ball oiler fittings. See **Figure 56** for some typical locations. Wipe off all oil ball fittings with a rag, and then oil the following locations:

- Cross Feed Table (1 ball oiler on top)
- Cross Feed Handwheel (1 ball oiler on top)
- Saddle Ways (2 ball oilers on top)
- Apron Handwheel Gear Axle (1 ball oiler on apron face)
- Compound Rest (1 ball oiler on top)
- Tailstock Barrel (1 ball oiler on top)
- Tailstock Handwheel (1 ball oiler on right side)
- Lead Screw Endcap Bushing (1 ball oiler, see **Figure 57**)
- Change Gear Spindle (1 ball oiler on end of shaft)
- Gear Spindle Ball Oiler (1 ball oiler, see **Figure 55**)
- Gearbox (4 ball oilers on top)

NOTICE

Failure to follow lubrication guidelines will lead to rapid deterioration of lathe/mill components.

Adjusting/Replacing the V-Belt

To replace or adjust the V-belts, do these steps:

1. DISCONNECT POWER TO THE LATHE/MILL!
2. Open the change gear access door (**Figure 58**).
3. Loosen the four motor access cover screws, and lift the cover off (**Figure 58**).
4. Using a 17mm wrench, loosen the two motor mount bolts shown in **Figure 58**.
5. Grasp the motor and lift upward to de-tension the belt and remove the belt.
6. Use solvent to clean the pulleys of oil and install the new belt.
7. Let the motor hang to tension the belt, and tighten the two motor mount bolts.
8. Close the access door and latch it shut.

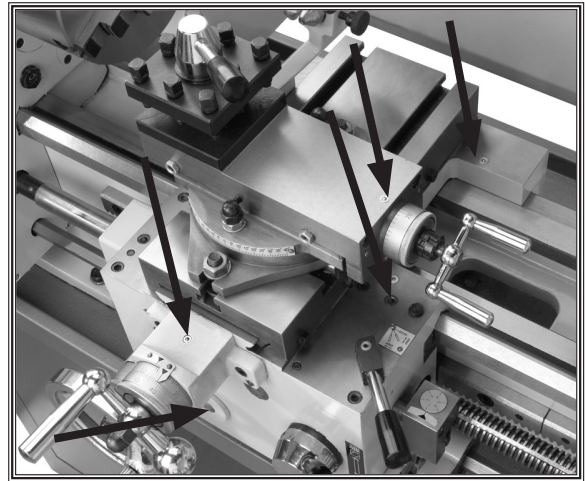


Figure 56. Typical ball fitting locations.



Figure 57. Lead screw end cap bushing.

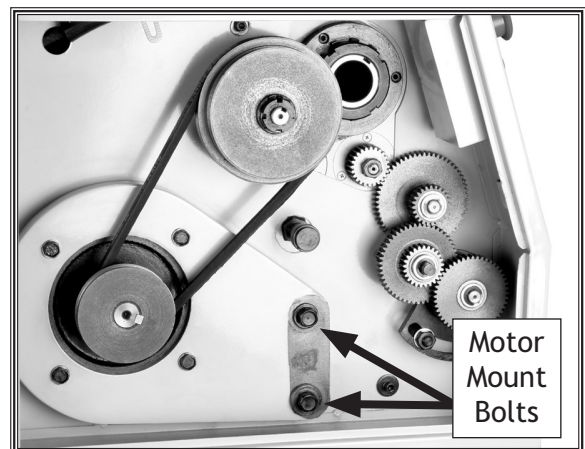


Figure 58. Motor mount bolts.

SERVICE

Cross Slide Backlash

Backlash is the amount of play found in a lead screw. It can be found by turning the cross slide handwheel in one direction, and then turning the handwheel the other direction. When the cross slide begins to move, the backlash has been taken up.

Note: Avoid the temptation to overtighten the cross slide backlash screw. Overtightening will cause excessive wear to the sliding block and lead screw.

Backlash is adjusted by tightening or loosening the screw shown in **Figure 59**. This screw draws a wedge-type nut against the lead screw and main nut. If you get it too tight, loosen the screw a few turns and tap the cross feed a few times with a rubber or wooden mallet. Then turn the handle slowly back and fourth until the handle turns freely. To readjust the backlash, rock the handle back and fourth and tighten the screw slowly until the backlash is at approximately 0.001" to 0.002" as indicated on the handwheel dial.

Note: Reducing backlash to less than 0.001" is impractical and reduces the life of the cross slide.

Cross Slide, Half-Nut, and Compound Slide Gib Adjustments

When adjusting these gibs (**Figures 60 and 61**), keep in mind that the goal is to remove sloppiness in the ways without causing the slides or half nut to bind. Loose gibs will cause a poor finish on the workpiece and may cause undue wear on the slide. Over-tightening may cause premature wear on the slide, lead screw, and half-nut. The cross slide gib is a tapered piece of iron. When the opposing front and rear gib adjustment screws are turned in opposing directions, the screws force the tapered gibs to fill the loose void in the way, thus tightening the play in the cross slide. If more play is needed turn the screws the other direction.

For the four saddle gibs, (**Figure 60**) loosen the jam nuts and turn the three set screws until there is slight tension felt and the gib plates are slightly preloaded against the underside of the flat-way. Tighten the jam nuts when finished.

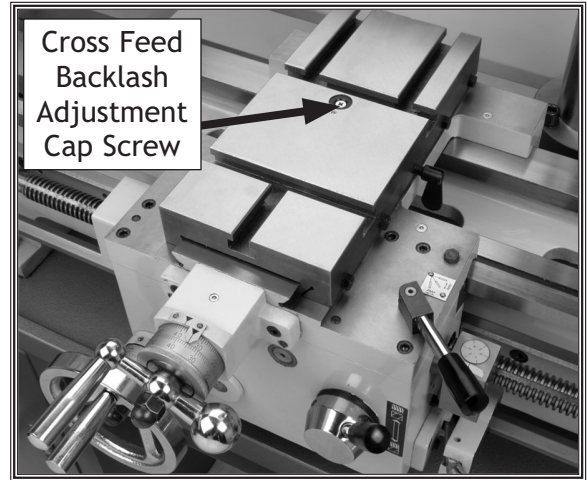


Figure 59. Cross slide backlash adjustment cap screw.

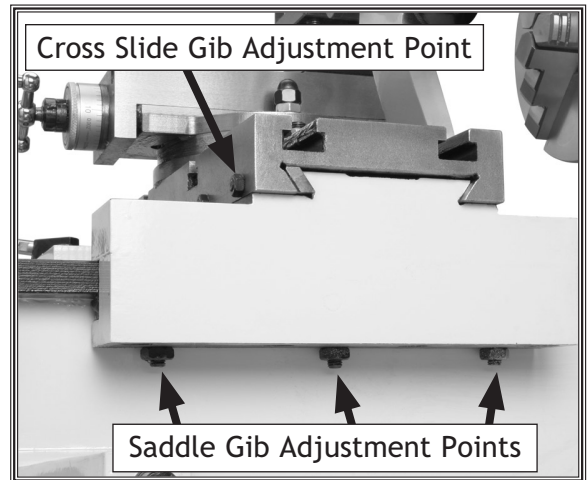


Figure 60. Gib adjustment points.

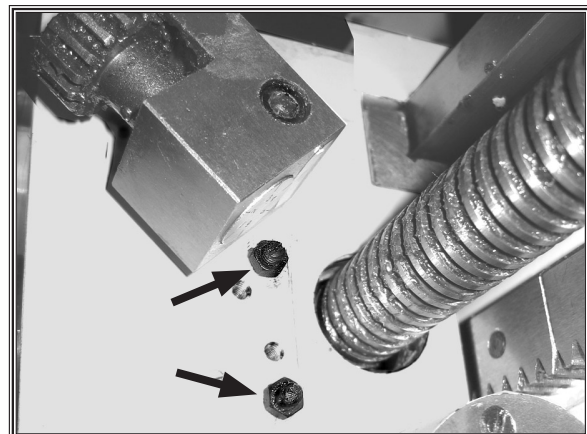


Figure 61. Half-nut gib adjustment location (thread dial is swung out of the way for gib adjustment).

Electrical Component and Connection Index

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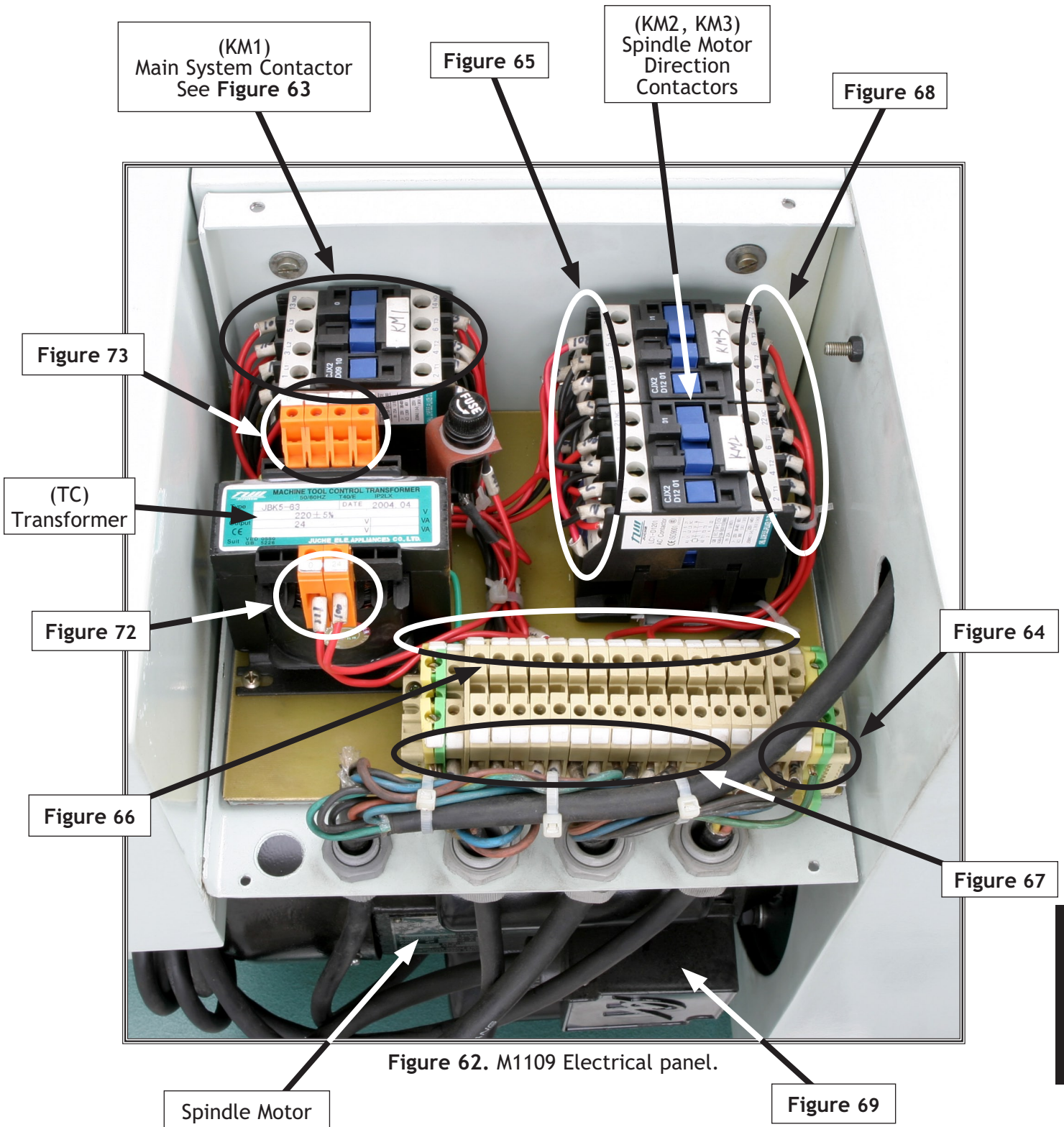


Figure 62. M1109 Electrical panel.

SERVICE

Electrical Connections

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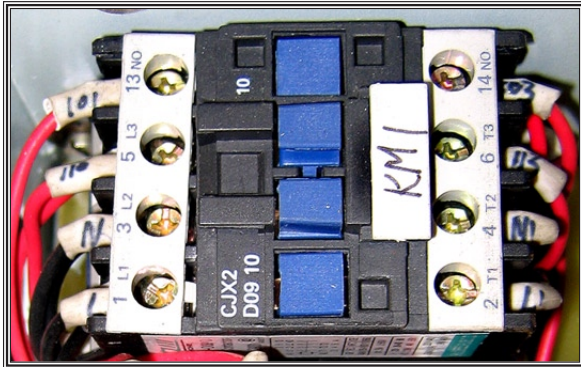


Figure 63. Contactor wiring (KM1).

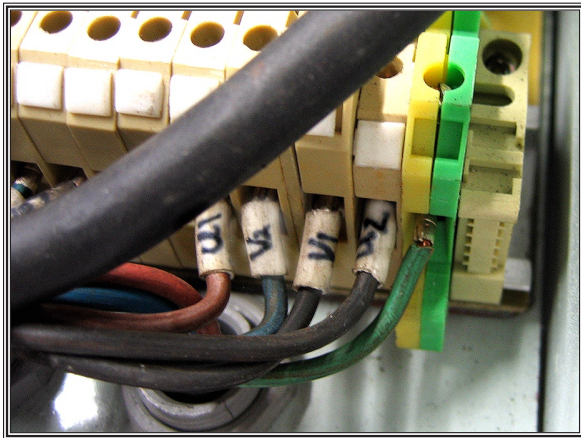


Figure 64. Junction block wiring.

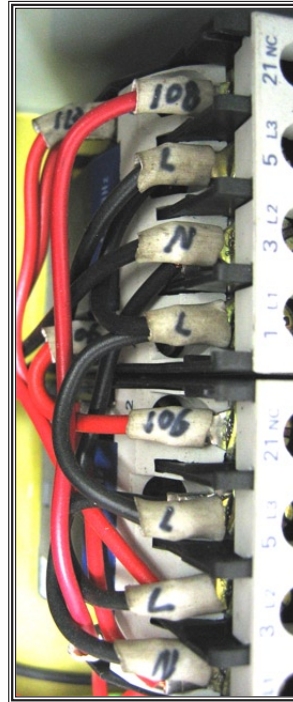


Figure 65. Contactor wiring (KM2 and KM3).

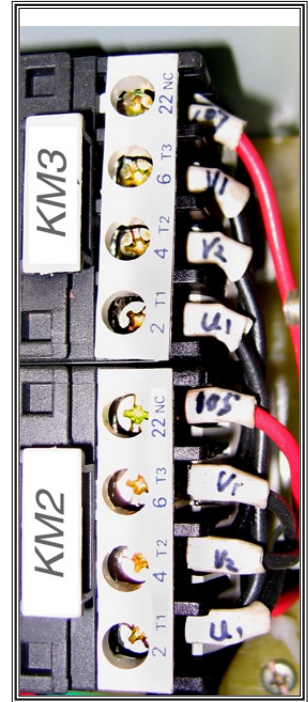


Figure 68. Contactor wiring (KM2 and KM3).

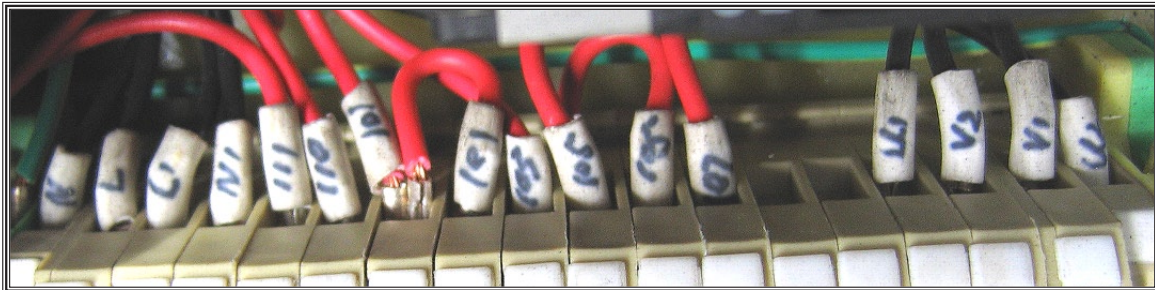


Figure 66. Junction block wiring.

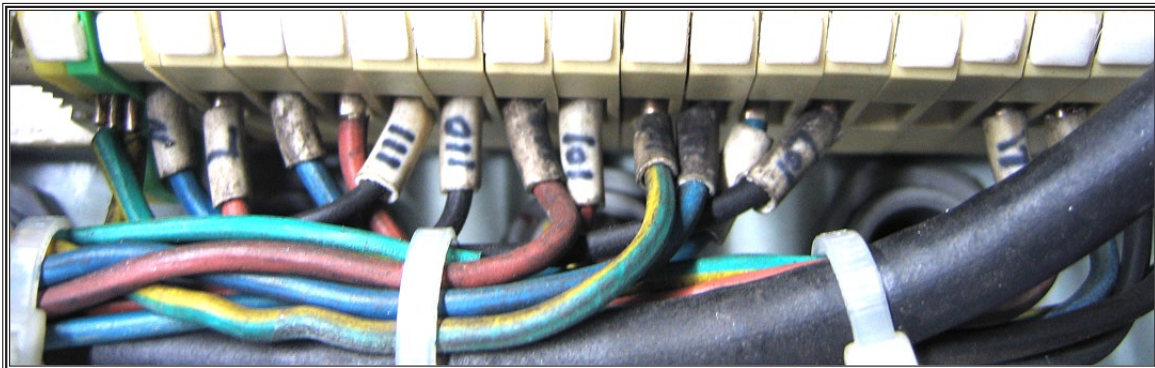


Figure 67. Junction block wiring.

Electrical Connections

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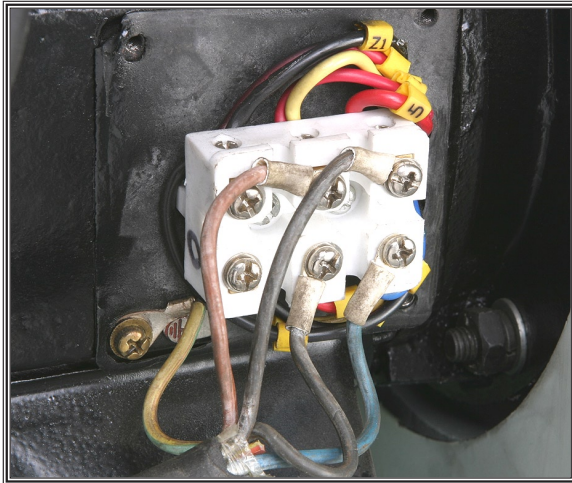


Figure 69. Motor connection.

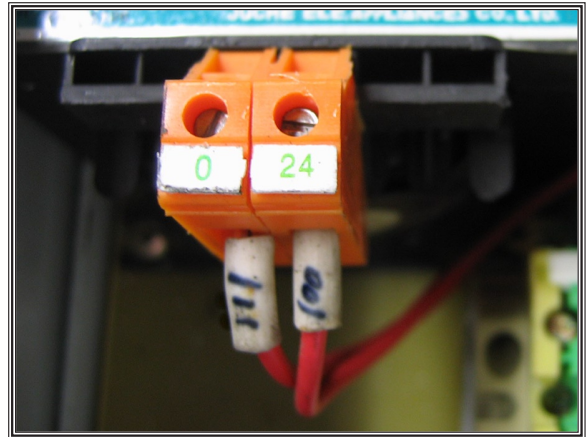


Figure 72. Transformer connection.

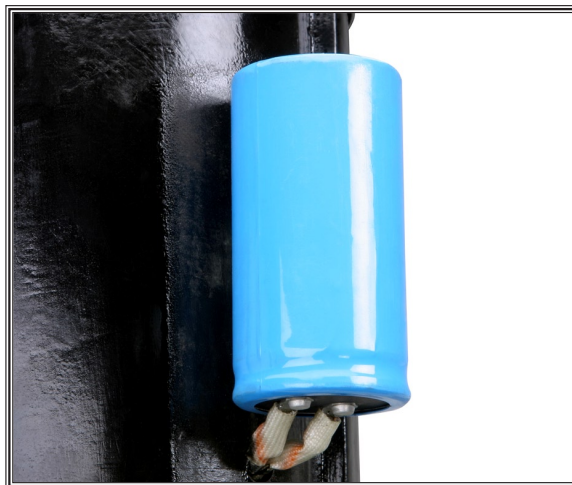


Figure 70. Start capacitor.

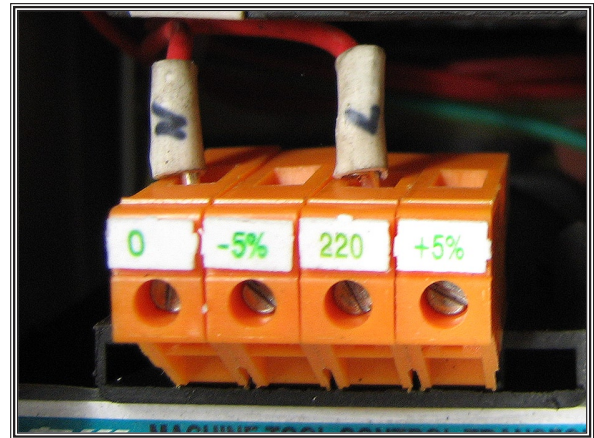


Figure 73. Transformer connection.



Figure 71. Mill power switch.

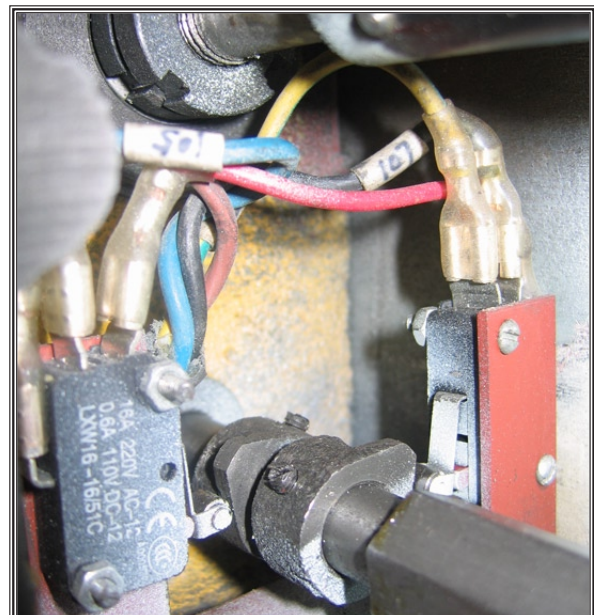


Figure 74. Lathe motor direction limit switches.

SERVICE

Electrical Connections

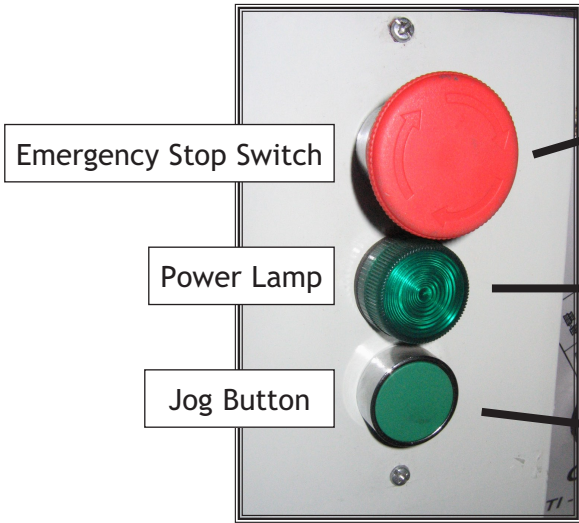


Figure 75. Lathe controls.

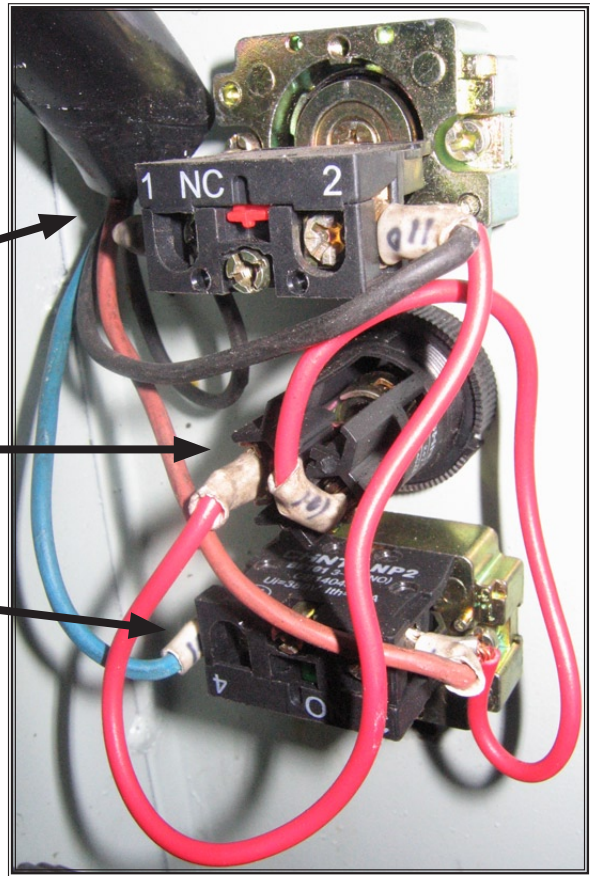
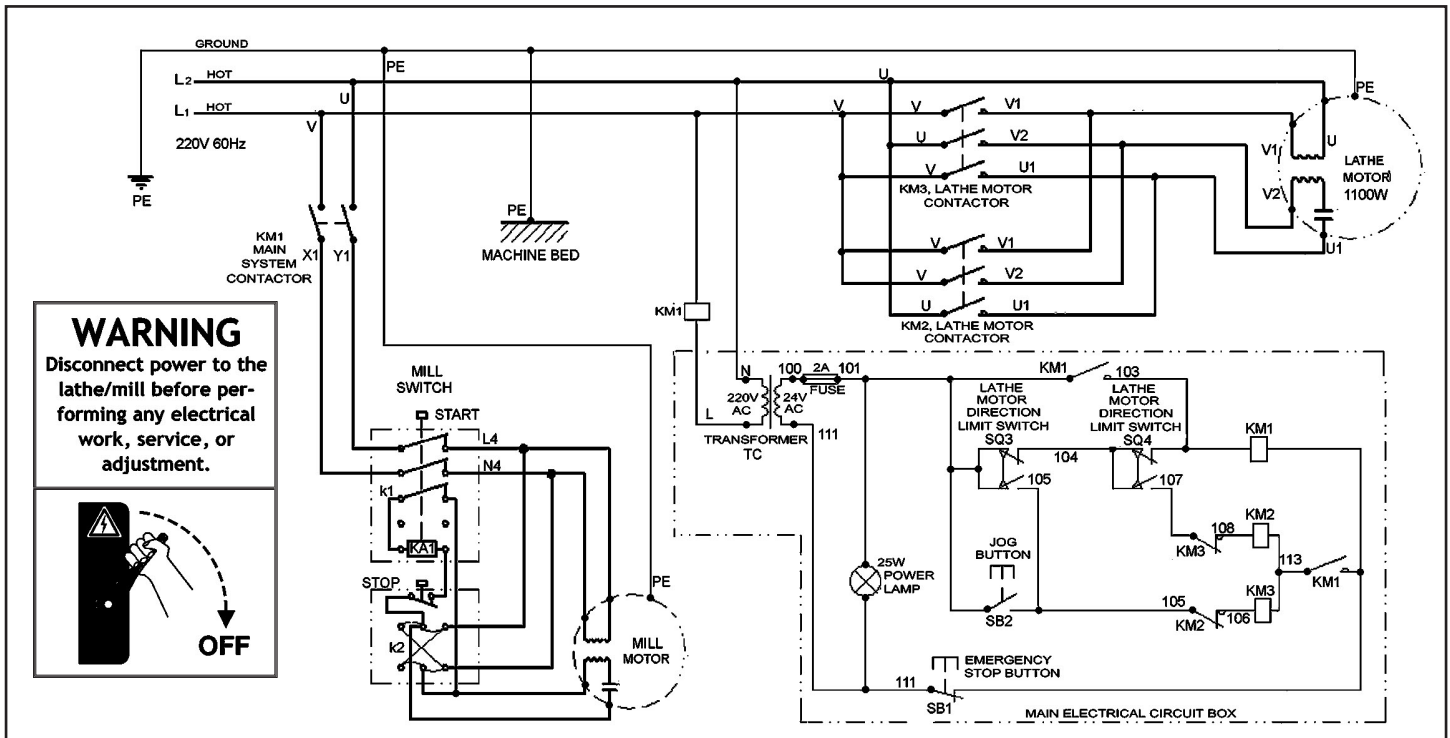


Figure 76. Lathe control panel wiring.

Wiring Diagram



SERVICE

Troubleshooting

This section covers the most common lathe problems. DO NOT make any adjustments until the lathe is disconnected from power and all moving parts have come to a complete stop.

Motor & Electrical

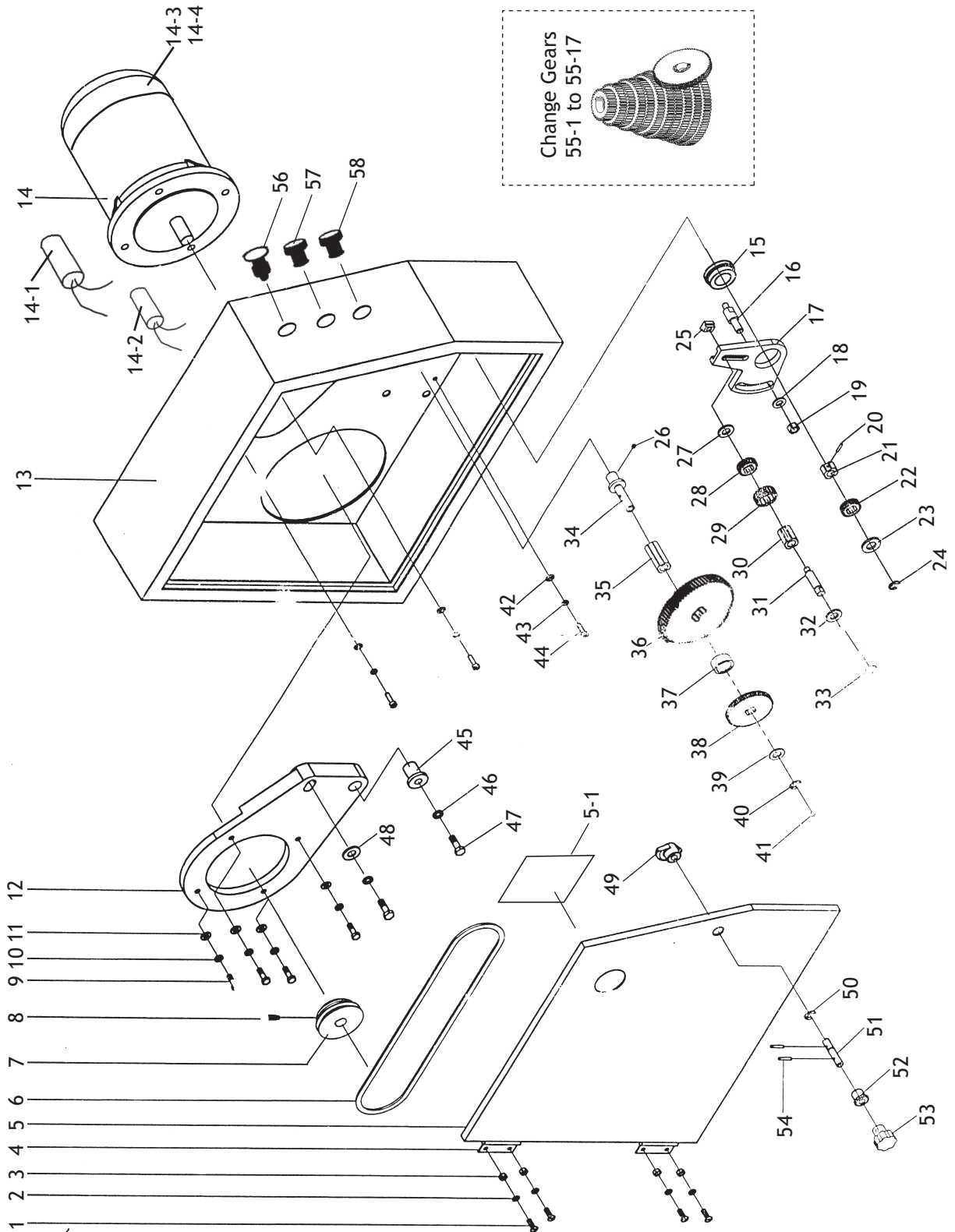
SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Motor will not start.	<ol style="list-style-type: none"> 1. Incorrect lathe operation. 2. Main power switch is OFF. 3. Emergency switch is pushed in. 4. Circuit breaker or fuse is at fault. 5. No voltage or open connection. 6. Motor is at fault. 	<ol style="list-style-type: none"> 1. Use the spindle direction ON/OFF lever. 2. Turn the main power switch ON at the back of the lathe. 3. Rotate emergency switch so it pops out. 4. Seek an electrician to troubleshoot and repair the shop power supply. 5. Test circuit, replace wires and connections as required. 6. Replace motor.
Fuses or circuit breakers trip open.	<ol style="list-style-type: none"> 1. Short circuit in line cord or plug. 2. Short circuit in motor or loose connections. 3. Incorrect fuses or circuit breakers in power supply. 	<ol style="list-style-type: none"> 1. Inspect cord or plug for damaged insulation and shorted wires. 2. Inspect all connections on motor for loose or shorted terminals or worn insulation. 3. Install correct fuses or circuit breakers.
Carriage hard to move.	<ol style="list-style-type: none"> 1. Chips have loaded up on bedways. 2. Bedways are dry and in need of lubrication. 3. Longitudinal stops are interfering. 4. Gibs are too tight. 	<ol style="list-style-type: none"> 1. Frequently clean away chips that load up during turning operations. 2. Lubricate bedways and handles. 3. Check to make sure that stops are floating and not hitting the center stop. 4. Loosen gib screw(s) slightly.
Machine is loud when cutting. Overheats or bogs down in the cut.	<ol style="list-style-type: none"> 1. Excessive depth of cut. 2. RPM or Feed Rate wrong for operation. 3. Dull cutters. 	<ol style="list-style-type: none"> 1. Decrease depth of cut. 2. Refer to RPM Feed rate chart for appropriate rates. 3. Sharpen or replace cutters.
Bad surface finish.	<ol style="list-style-type: none"> 1. Wrong RPM or feed rate. 2. Dull tooling or tool not centered correctly. 3. Too much play in gibs. 	<ol style="list-style-type: none"> 1. Adjust for appropriate RPM and feed rate. 2. Sharpen tooling and/or center tool correctly. 3. Tighten gibs.
Gear change levers will not shift into position.	<ol style="list-style-type: none"> 1. Gears not aligned in headstock. 	<ol style="list-style-type: none"> 1. Rotate spindle by hand until gear falls into place.
Can't remove tapered tool from quill.	<ol style="list-style-type: none"> 1. Quill had not retracted all the way back into the tailstock. 	<ol style="list-style-type: none"> 1. Turn the quill handwheel until it forces taper out of quill.

Operation and Work Results

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Entire machine vibrates excessively upon startup and while running.	<ol style="list-style-type: none"> 1. Workpiece is unbalanced. 2. Worn or broken gear present. 3. Chuck or faceplate has become unbalanced. 4. Spindle bearings badly worn. 	<ol style="list-style-type: none"> 1. Reinstall workpiece so it is as centered with the spindle bore as possible. 2. Inspect gears and replace if necessary. 3. Rebalance chuck or faceplate; contact a local machine shop for help. 4. Replace spindle bearings.
Bad surface finish.	<ol style="list-style-type: none"> 1. Wrong RPM or feed rate. 2. Dull tooling or poor tool selection. 3. Too much play in gibs. 4. Tool too high. 	<ol style="list-style-type: none"> 1. Adjust for appropriate RPM and feed rate. 2. Sharpen tooling or select a better tool for the intended operation. 3. Tighten gibs. 4. Lower the tool position.
Can't remove tapered tool from tailstock quill.	<ol style="list-style-type: none"> 1. Quill had not retracted all the way back into the tailstock. 2. Debris was not removed from taper before inserting into quill. 	<ol style="list-style-type: none"> 1. Turn the quill handwheel until it forces taper out of quill. 2. Always make sure that taper surfaces are clean.
Cross slide, compound slide, or carriage feed has sloppy operation.	<ol style="list-style-type: none"> 1. Gibs are out of adjustment. 2. Handwheel is loose. 3. Lead screw mechanism worn or out of adjustment. 	<ol style="list-style-type: none"> 1. Tighten gib screw(s). 2. Tighten handwheel fasteners. 3. Tighten any loose fasteners on lead screw mechanism.
Cross slide, compound slide, or carriage feed handwheel is hard to move.	<ol style="list-style-type: none"> 1. Gibs are loaded up with shavings, dust, or grime. 2. Gib screws are too tight. 3. Backlash setting too tight (cross slide only). 4. Bedways are dry. 	<ol style="list-style-type: none"> 1. Remove gibs, clean ways/dovetails, lubricate, and readjust gibs. 2. Loosen gib screw(s) slightly, and lubricate bedways. 3. Slightly loosen backlash setting by loosening the locking screw and adjusting the spanner ring at the end of the handle. 4. Lubricate bedways and handles.
Cutting tool or machine components vibrate excessively during cutting.	<ol style="list-style-type: none"> 1. Tool holder not tight enough. 2. Cutting tool sticks too far out of tool holder; lack of support. 3. Gibs are out of adjustment. 4. Dull cutting tool. 5. Incorrect spindle speed or feed rate. 	<ol style="list-style-type: none"> 1. Check for debris, clean, and retighten. 2. Reinstall cutting tool so no more than 1/3 of the total length is sticking out of tool holder. 3. Tighten gib screws at affected component. 4. Replace or sharpen cutting tool. 5. Use the recommended spindle speed.
Inaccurate turning results from one end of the workpiece to the other.	<ol style="list-style-type: none"> 1. Headstock and tailstock are not properly aligned with each other. 	<ol style="list-style-type: none"> 1. Realign the tailstock to the headstock spindle bore center line.
Chuck jaws won't move or don't move easily.	<ol style="list-style-type: none"> 1. Chips lodged in the jaws. 	<ol style="list-style-type: none"> 1. Remove jaws, clean and lubricate chuck threads, and replace jaws.
Carriage won't feed.	<ol style="list-style-type: none"> 1. Gears are not all engaged. 2. Gears are broken. 3. Loose screw on the feed handle. 	<ol style="list-style-type: none"> 1. Adjust gear positions. 2. Replace. 3. Tighten.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Loud, repetitious noise coming from machine at or near the motor.	<ol style="list-style-type: none"> 1. Pulley setscrews or keys are missing or loose. 2. Motor fan is hitting the cover. 	<ol style="list-style-type: none"> 1. Inspect keys and setscrews. Replace or tighten if necessary. 2. Tighten fan or shim cover, or replace items.
Carriage hard to move.	<ol style="list-style-type: none"> 1. Carriage lock is tightened down. 2. Chips have loaded up on bedways. 3. Bedways are dry and in need of lubrication. 4. Longitudinal stops are interfering. 5. Gibs are too tight. 	<ol style="list-style-type: none"> 1. Check to make sure table locks are fully released. 2. Frequently clean away chips that load up during turning operations. 3. Lubricate bedways and handles. 4. Check to make sure that stops are floating and not hitting the center stop. 5. Loosen gib screw(s) slightly.
Gear change levers will not shift into position.	<ol style="list-style-type: none"> 1. Gears not aligned in headstock. 	<ol style="list-style-type: none"> 1. Rotate spindle by hand until gear falls into place.
Motor overheats.	<ol style="list-style-type: none"> 1. Motor overloaded. 2. Air circulation through the motor restricted. 	<ol style="list-style-type: none"> 1. Reduce load on motor. 2. Clean out motor to provide normal air circulation.
Loud, repetitious noise coming from machine.	<ol style="list-style-type: none"> 1. Gears not aligned in headstock or no backlash. 2. Broken gear or bad bearing. 3. Workpiece is hitting stationary object. 	<ol style="list-style-type: none"> 1. Adjust gears and establish backlash. 2. Replace broken gear or bearing. 3. Stop lathe immediately and correct interference problem.
Tailstock quill will not feed out of tailstock.	<ol style="list-style-type: none"> 1. Quill lock lever is tightened down. 	<ol style="list-style-type: none"> 1. Turn lever counterclockwise.
Motor is loud when cutting. Overheats or bogs down in the cut.	<ol style="list-style-type: none"> 1. Excessive depth of cut or feed rate. 2. RPM or feed rate wrong for cutting operation. 3. Cutting tool is dull. 4. Gear setup is too tight, causing them to bind. 	<ol style="list-style-type: none"> 1. Decrease depth of cut or feed rate. 2. Refer to RPM feed rate chart for appropriate rates. 3. Sharpen or replace the cutting tool. 4. Readjust the gear setup with a small amount of backlash so the gears move freely and smoothly when the chuck is rotated by hand.

Lathe Change Gear Housing Diagram (0000 Series Parts)

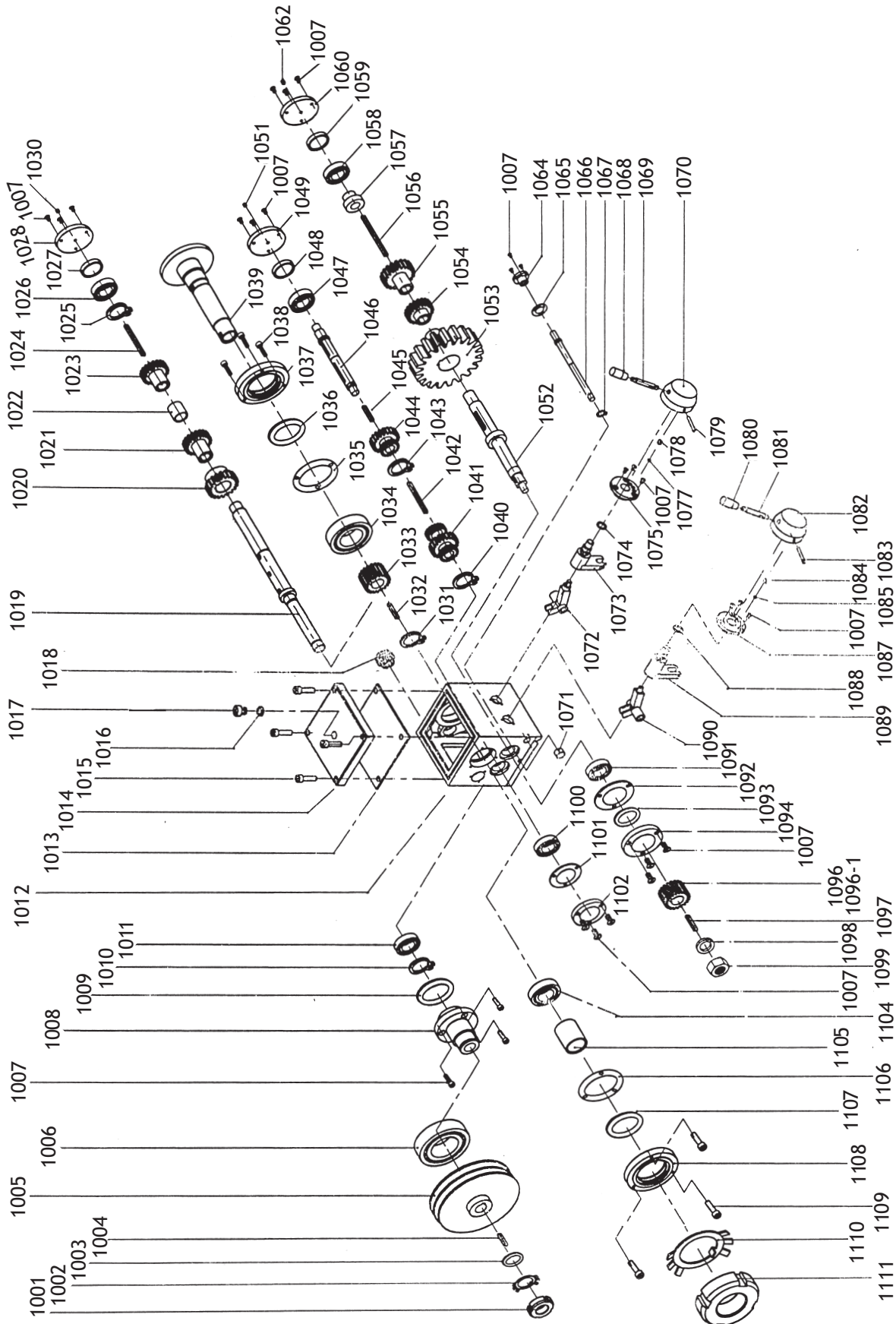


0000 Series Parts List

REF	PART #	DESCRIPTION
1	XPS38M	PHLP HD SCR M4-.7 X 10
2	XPLW02M	LOCK WASHER 4MM
3	XPNO4M	HEX NUT M4-.7
4	XM11090004	HINGE
5	XM11090005	DOOR
5-1	XM11090005-1	CHANGE GEAR CHART
6	XPVA71	V-BELT A-71 4L710
7	XM11090007	PULLEY
8	XPSS03M	SET SCREW M6-1 X 8
9	XPB07M	HEX BOLT M8-1.25 X 25
10	XPLW04M	LOCK WASHER 8MM
11	XPW01M	FLAT WASHER 8MM
12	XM11090012	MOTOR MOUNT PLATE
13	XM11090013	COMPOUND BOX
14	XM11090014	MOTOR 3/4HP 220V
14-1	XM11090014-1	RUN CAPACITOR 20MFD/450VAC
14-2	XM11090014-2	S. CAPACITOR 150MFD/250VAC
14-3	XM11090014-3	MOTOR FAN
14-4	XM11090014-4	FAN COVER
15	XM11090015	SLEEVE
16	XM11090016	SHAFT
17	XM11090017	LASH ADJUSTER
18	XPW04M	FLAT WASHER 10MM
19	XPNO2M	HEX NUT M10-1.5
20	XM11090020	ROLL PIN 3 X 18MM
21	XM11090021	SPLINED WEAR BUSHING (13MM LONG)
22	XM11090022	CHANGE GEAR (48-TOOTH)
23	XPW06M	FLAT WASHER 12MM
24	XPEC12M	E-CLIP 12MM
25	XM11090025	T-NUT
26	XM11090026	SPECIAL SCREW
27	XPW06M	FLAT WASHER 12MM
28	XM11090028	CHANGE GEAR (50-TOOTH)
29	XM11090029	CHANGE GEAR (25-TOOTH)
30	XM11090030	SPLINED WEAR BUSHING (26MM LONG)
31	XM11090031	IDLER SHAFT
32	XPW06M	FLAT WASHER 12MM
33	XM11090033	E-CLIP 12MM
34	XM11090034	IDLER SHAFT

REF	PART #	DESCRIPTION
35	XM11090035	EXTENDED SPLINED WEAR BUSHING
36	XM11090036	CHANGE GEAR (60-TOOTH)
37	XM11090037	SPACER SLEEVE
38	XM11090038	CHANGE GEAR (24-TOOTH)
39	XPW06M	FLAT WASHER 12MM
40	XM11090040	E-CLIP 12MM
41	XM11090041	BALL OILER 6MM
42	XPW03M	FLAT WASHER 6MM
43	XPLW03M	LOCK WASHER 6MM
44	XPSB01M	CAP SCREW M6-1 X 16
45	XM11090045	SHOULDER BUSHING
46	XPLW06M	LOCK WASHER 10MM
47	XPB116M	HEX BOLT M10-1.5 X 45
48	XPW04M	FLAT WASHER 10MM
49	XM11090049	DOOR LATCH
50	XPEC09M	E-CLIP 6MM
51	XM11090051	TUMBLER SHAFT
52	XM11090052	SHOULDER SLEEVE
53	XM11090053	STAR-GRIP KNOB #8-32
54	XM11090054	TAPER PINS
55-1	XM11090055-1	CHANGE GEAR (24-TOOTH)
55-2	XM11090055-2	CHANGE GEAR (25-TOOTH)
55-3	XM11090055-3	CHANGE GEAR (27-TOOTH)
55-4	XM11090055-4	CHANGE GEAR (28-TOOTH)
55-5	XM11090055-5	CHANGE GEAR (30-TOOTH)
55-6	XM11090055-6	CHANGE GEAR (32-TOOTH)
55-7	XM11090055-7	CHANGE GEAR (34-TOOTH)
55-8	XM11090055-8	CHANGE GEAR (35-TOOTH)
55-9	XM11090055-9	CHANGE GEAR (36-TOOTH)
55-10	XM11090055-10	CHANGE GEAR (40-TOOTH)
55-11	XM11090055-11	CHANGE GEAR (42-TOOTH)
55-12	XM11090055-12	CHANGE GEAR (44-TOOTH)
55-13	XM11090055-13	CHANGE GEAR (46-TOOTH)
55-14	XM11090055-14	CHANGE GEAR (48-TOOTH)
55-15	XM11090055-15	CHANGE GEAR (50-TOOTH)
55-16	XM11090055-16	CHANGE GEAR (52-TOOTH)
55-17	XM11090055-17	CHANGE GEAR (60-TOOTH)
56	XM11090056	EMERGENCY STOP SWITCH
57	XM11090057	GREEN POWER LAMP
58	XM11090058	JOG BUTTON

Thread Dial Diagram (1000 Series Parts)



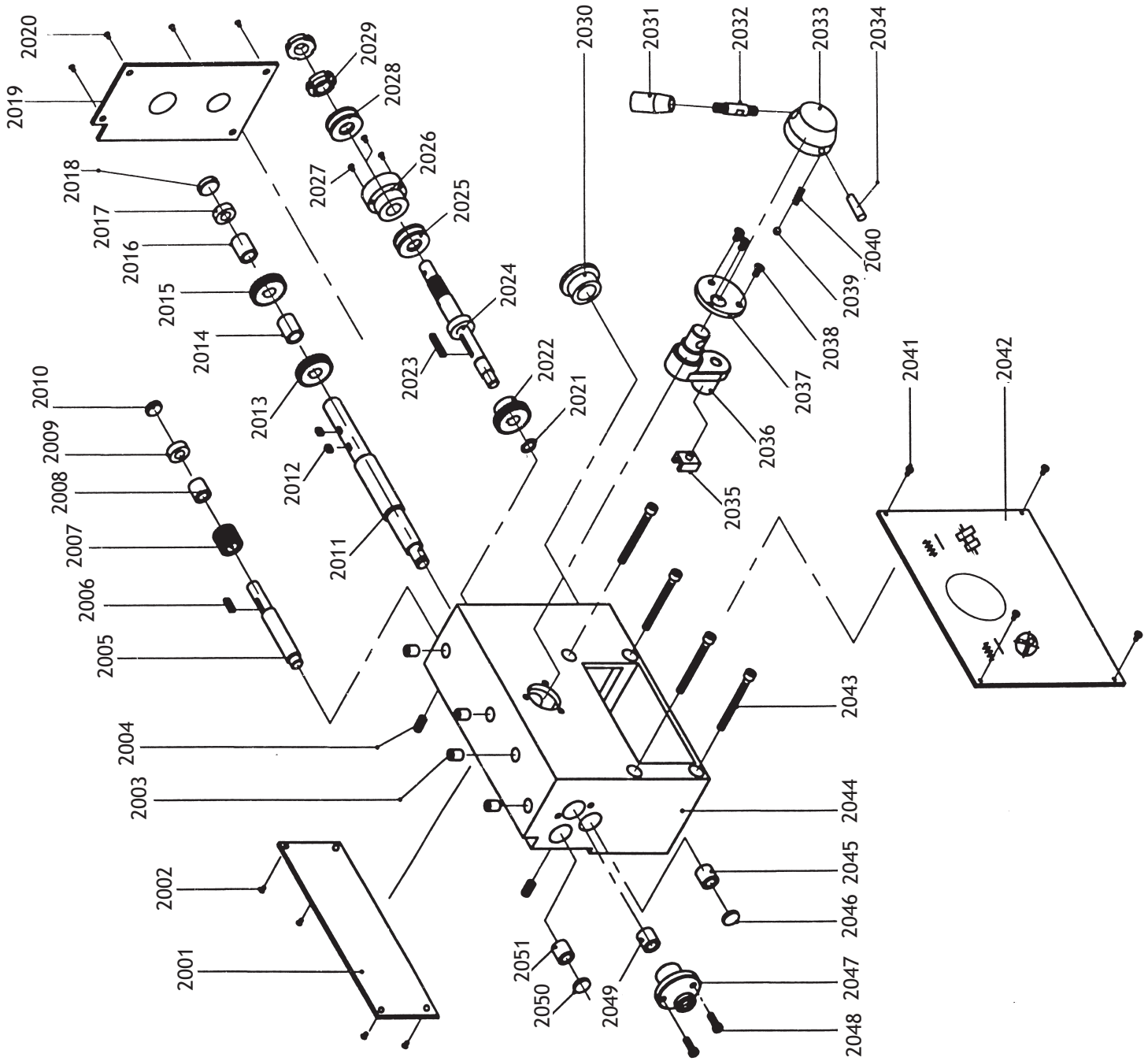
PARTS

1000 Series Parts List

REF	PART #	DESCRIPTION
1001	XM11091001	SPANNER NUT M16-1.5
1002	XM11091002	TANG WASHER
1003	XPW08M	FLAT WASHER 16MM
1004	XPK08M	KEY 5 X 5 X 16
1005	XM11091005	SPINDLE PULLEY
1006	XM11091006	TAPER ROLLER BEARING 60206
1007	XPSB33M	CAP SCREW M5-.8 X 12
1008	XM11091008	HUB
1009	XM11091009	FELT SEAL
1010	XPR06M	EXT RETAINING RING 16MM
1011	XM11091011	BALL BEARING 203
1012	XM11091012	HEADSTOCK CASTING
1013	XM11091013	GASKET
1014	XM11091014	HEADSTOCK COVER
1015	XPSB13M	CAP SCREW M8-1.25 X 30
1016	XM11091016	O-RING 30 X 20 X 2MM
1017	XM11091017	FILL PLUG
1018	XM11091018	SIGHT GLASS
1019	XM11091019	SPINDLE SHAFT
1020	XM11091020	GEAR (42-TOOTH)
1021	XM11091021	GEAR (20-TOOTH)
1022	XM11091022	SLEEVE SPACER
1023	XM11091023	GEAR (30-TOOTH)
1024	XPK13M	KEY 5 X 5 X 70
1025	XPR07M	EXT RETAINING RING 18MM
1026	XM11091011	BALL BEARING 203
1027	XM11091027	BEARING SLEEVE
1028	XM11091028	END CAP
1030	XPSS03M	SET SCREW M6-1 X 8
1031	XPR78M	EXT RETAINING RING 55MM
1032	XM11091032	THIN FLAT KEY
1033	XM11091033	GEAR (56-TOOTH)
1034	XM11091034	TAPER ROLLER BEARING D2007112
1035	XM11091035	SPANNER WASHER 120MM
1036	XM11091036	FELT RING
1037	XM11091037	MAINSHAFT OIL SEAL
1038	XPB42M	HEX BOLT M5-.8 X 20
1039	XM11091039	LATHE SPINDLE
1040	XPR09M	EXT RETAINING RING 20MM
1041	XM11091041	CLUSTER GEAR
1042	XM11091042	KEY 5 X 5 X 60
1043	XPR09M	EXT RETAINING RING 20MM
1044	XM11091044	COMBO GEAR (22/57-TOOTH)
1045	XPK02M	KEY 5 X 5 X 40
1046	XM11091046	INTERMEDIATE SHAFT
1047	XM11091011	BALL BEARING 203
1048	XM11091048	SLEEVE
1049	XM11091049	END CAP
1051	XPSS03M	SET SCREW M6-1 X 8
1052	XM11091052	OUTPUT SHAFT
1053	XM11091053	HUGE GEAR (68-TOOTH)
1054	XM11091054	GEAR (33-TOOTH)
1055	XM11091055	GEAR (56-TOOTH)

REF	PART #	DESCRIPTION
1056	XM11091056	KEY 5 X 5 X 60
1057	XM11091057	SPACER SLEEVE
1058	XM11091011	BALL BEARING 203
1059	XM11091059	SLEEVE
1060	XM11091060	END CAP
1062	XPSS03M	SET SCREW M6-1 X 8
1064	XM11091064	FIXED FLANGE
1065	XM11091065	SPANNER WASHER 45MM
1066	XM11091066	SHIFT FORK SHAFT
1067	XPR03M	EXT RETAINING RING 12MM
1068	XM11091068	FEMALE KNOB M8-1.25 X 40
1069	XM11091069	LEVER
1070	XM11091070	LEVER HUB
1071	XM11091071	OIL DRAIN
1072	XM11091072	RIGHT SHIFTING FORK
1073	XM11091073	RIGHT SHIFTING FORK SHAFT
1074	XM11091074	O-RING
1075	XM11091075	FIXED FLANGE
1077	XM11091077	STEEL BALL 6.5MM
1078	XM11091078	COMPRESSION SPRING
1079	XM11091079	TAPER PIN
1080	XM11091080	FEMALE KNOB M8-1.25 X 40
1081	XM11091081	LEVER
1082	XM11091082	LEVER HUB
1083	XM11091083	TAPER PIN
1084	XM11091084	COMPRESSION SPRING
1085	XM11091077	STEEL BALL 6.5MM
1087	XM11091087	FLANGE
1088	XM11091088	OIL SEAL 16 X 2.4MM
1089	XM11091089	LEFT SHIFTING FORK SHAFT
1090	XM11091090	LEFT SHIFTING FORK
1091	XM11091011	BALL BEARING 203
1092	XM11091092	SPANNER WASHER
1093	XM11091093	FELT RING
1094	XM11091094	FLANGE
1096	XM11091096	KEYED DRIVE GEAR (24-FINE TOOTH)
1096-1	XM11091096-1	KEYED DRIVE GEAR SET (28 & 35-CORSE TOOTH)
1097	XPK05M	KEY 4 X 4 X 10
1098	XPLW06M	LOCK WASHER 10MM
1099	XPN02M	HEX NUT M10-1.5
1100	XM11091011	BALL BEARING 203
1101	XM11091101	SPANNER WASHER 60MM
1102	XM11091102	END CAP
1104	XM11091104	TAPER ROLLER BEARING 2007110
1105	XM11091105	SPECIAL WASHER
1106	XM11091106	SPANNER WASHER 105MM
1107	XM11091107	FELT RING
1108	XM11091108	END CAP
1109	XM11091109	CAP SCREW
1110	XM11091110	TANG WASHER
1111	XM11091111	SPANNER NUT

Leadscrew Gearbox Diagram (2000 Series Parts)

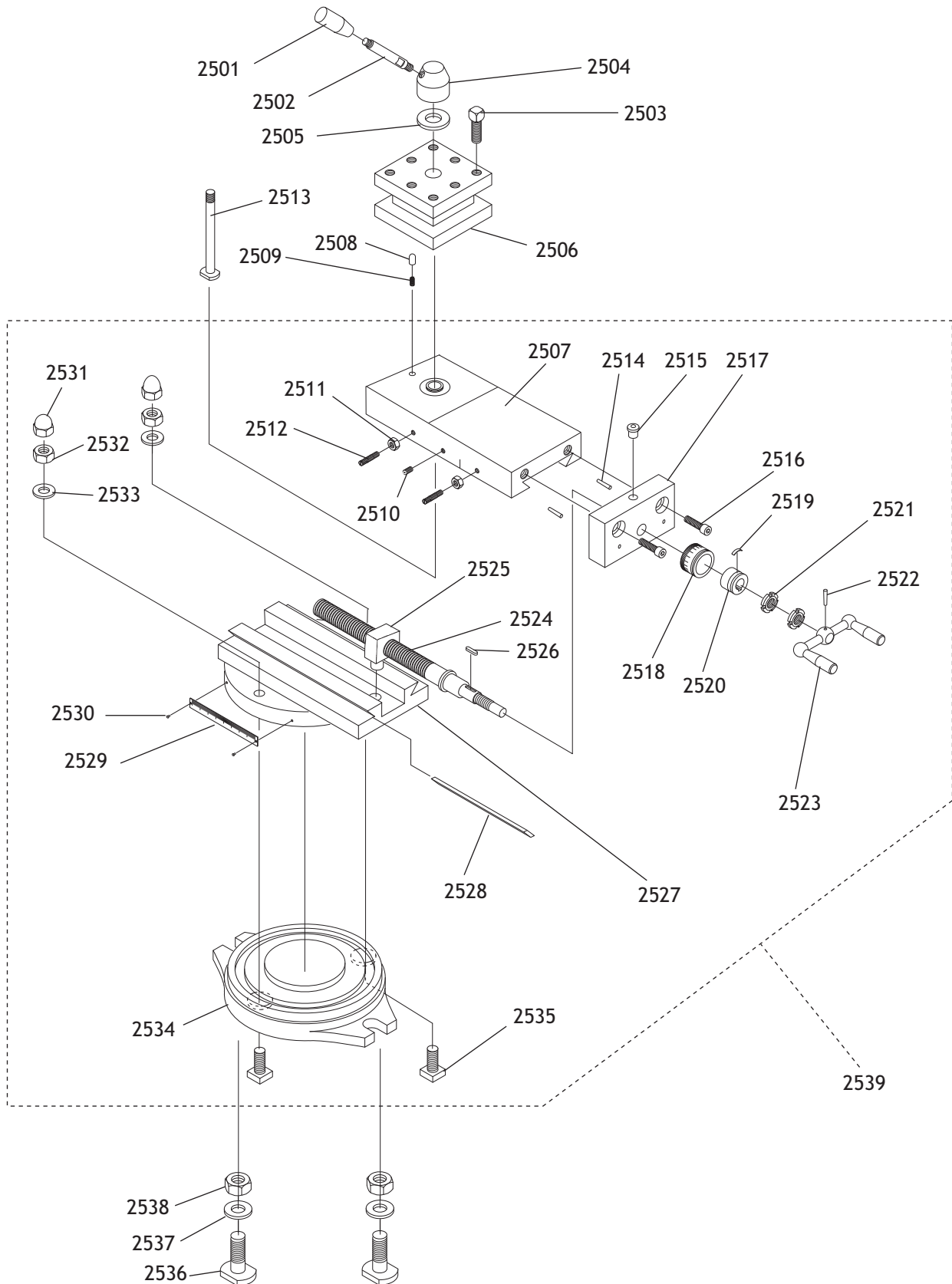


2000 Series Parts List

REF	PART #	DESCRIPTION
2001	XM11092001	COVER PLATE
2002	XPS05M	PHLP HD SCR M5-.8 X 8
2003	XM11092003	BALL OILER 8MM
2004	XM11092004	SPECIAL SET SCREW M5-.8 X 6
2005	XM11092005	SHAFT
2006	XPK08M	KEY 5 X 5 X 16
2007	XM11092007	GEAR (20-TOOTH)
2008	XM11092008	SPACER
2009	XM11092009	SLEEVE
2010	XM11092010	PLUG
2011	XM11092011	SHAFT
2012	XPK127M	KEY 5 X 5 X 8
2013	XM11092013	GEAR (20-TOOTH)
2014	XM11092014	SPACER
2015	XM11092015	GEAR (20-TOOTH)
2016	XM11092016	SPACER
2017	XM11092017	SLEEVE
2018	XM11092018	PLUG
2019	XM11092019	COVER PLATE
2020	XPS07M	PHLP HD SCR M4-.7 X 8
2021	XPR06M	EXT RETAINING RING 16MM
2022	XM11092022	GEAR (20-TOOTH)
2023	XPK126M	KEY 5 X 5 X 32
2024	XM11092024	SHAFT
2025	XP51102	BEARING 8102
2026	XM11092026	FLANGE HUB

REF	PART #	DESCRIPTION
2027	XPSB24M	CAP SCREW M5-.8 X 16
2028	XP8102	BEARING 8102
2029	XM11092029	SPANNER NUT
2030	XM11092030	FLANGE HUB
2031	XM11092031	FEMALE KNOB M8-1.25 X 40MM
2032	XM11092032	LEVER
2033	XM11092033	LEVER HUB
2034	XM11092034	TAPER PIN
2035	XM11092035	SHIFTING YOKE
2036	XM11092036	SHIFTING FORK
2037	XM11092037	LOCATING PLATE
2038	XPFH07M	FLAT HD SCR M5-.8 X 10
2039	XM11091077	STEEL BALL 6.5MM
2040	XM11092040	COMPRESSION SPRING
2041	XPS12M	PHLP HD SCR M3-.5 X 6
2042	XM11092042	FRONT PANEL
2043	XM11092043	CAP SCREW M8-1.25 X 100
2044	XM11092044	HOUSING
2045	XM11092045	BUSHING
2046	XM11092046	PLUG
2047	XM11092047	FLANGE HUB
2048	XPSB33M	CAP SCREW M5-.8 X 12
2049	XM11092049	BUSHING
2050	XM11092050	PLUG
2051	XM11092051	BUSHING

Compound Rest and Tool Post Diagram (2500 Series Parts)



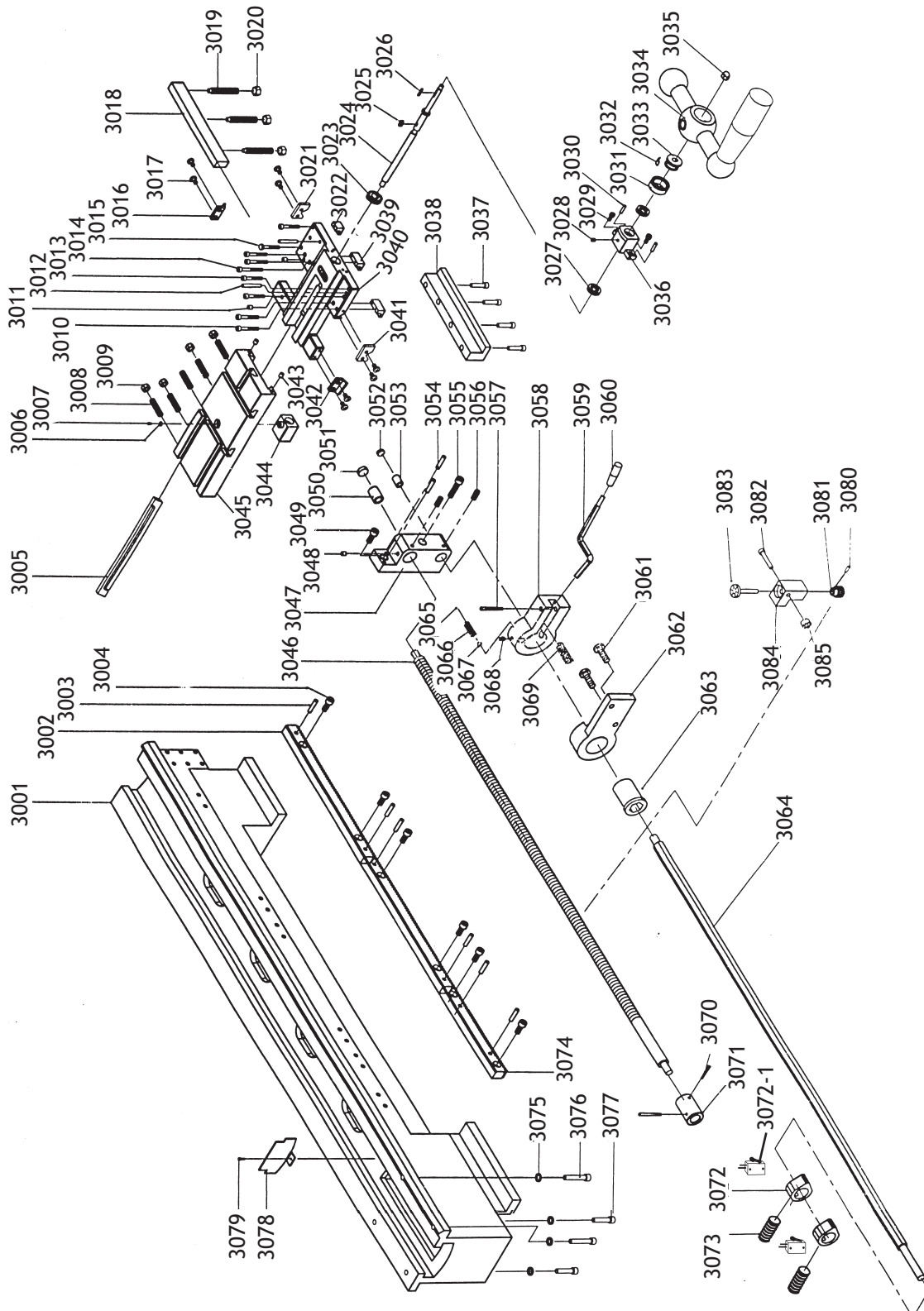
PARTS

2500 Series Parts List

REF	PART #	DESCRIPTION
2501	XM11092501	FEMALE KNOB 5/16-18
2502	XM11092502	LEVER 5/16-20
2503	XM11092503	TOOL POST BOLT M10-1.5 X 20
2504	XM11092504	LEVER HUB
2505	XM11092505	SPACER
2506	XM11092506	FOUR-WAY TOOL POST
2507	XM11092507	SLIDE
2508	XM11092508	DETENT PIN
2509	XM11092509	COMPRESSION SPRING
2510	XPSS64M	SET SCREW M6-1 X 15
2511	XPN01M	HEX NUT M6-1
2512	XPSS01M	SET SCREW M6-1 X 10
2513	XM11092513	T-BOLT
2514	XM11092514	DOWEL PIN
2515	XM11092515	BALL OILER
2516	XPSB01M	CAP SCREW M6-1 X 16
2517	XM11092517	END BLOCK
2518	XM11092518	SCALE HUB
2519	XM11092519	FLAT SPRING
2520	XM11092520	HUB

REF	PART #	DESCRIPTION
2521	XM11092521	SPANNER NUT
2522	XM11092522	TAPERED PIN
2523	XM11092523	HANDLE ASSY
2524	XM11092524	LEAD SCREW
2525	XM11092525	LEAD SCREW NUT
2526	XM11092526	SPECIAL KEY
2527	XM11092527	WAY BASE
2528	XM11092528	GIB
2529	XM11092529	SCALE PLATE
2530	XM11092530	RIVET
2531	XPN18M	ACORN NUT M8-1.25
2532	XPN03M	HEX NUT M8-1.25
2533	XPW01M	FLAT WASHER 8MM
2534	XM11092534	BASE
2535	XM11092535	T-NUT M8-1.25 X 25
2536	XM11092536	T-NUT M10-1.5 X 32
2537	XPW04M	FLAT WASHER 10MM
2538	XPN02M	HEX NUT M10-1.5
2539	XM11092539	COMPLETE COMPOUND REST

Bed Diagram (3000 Series Parts)

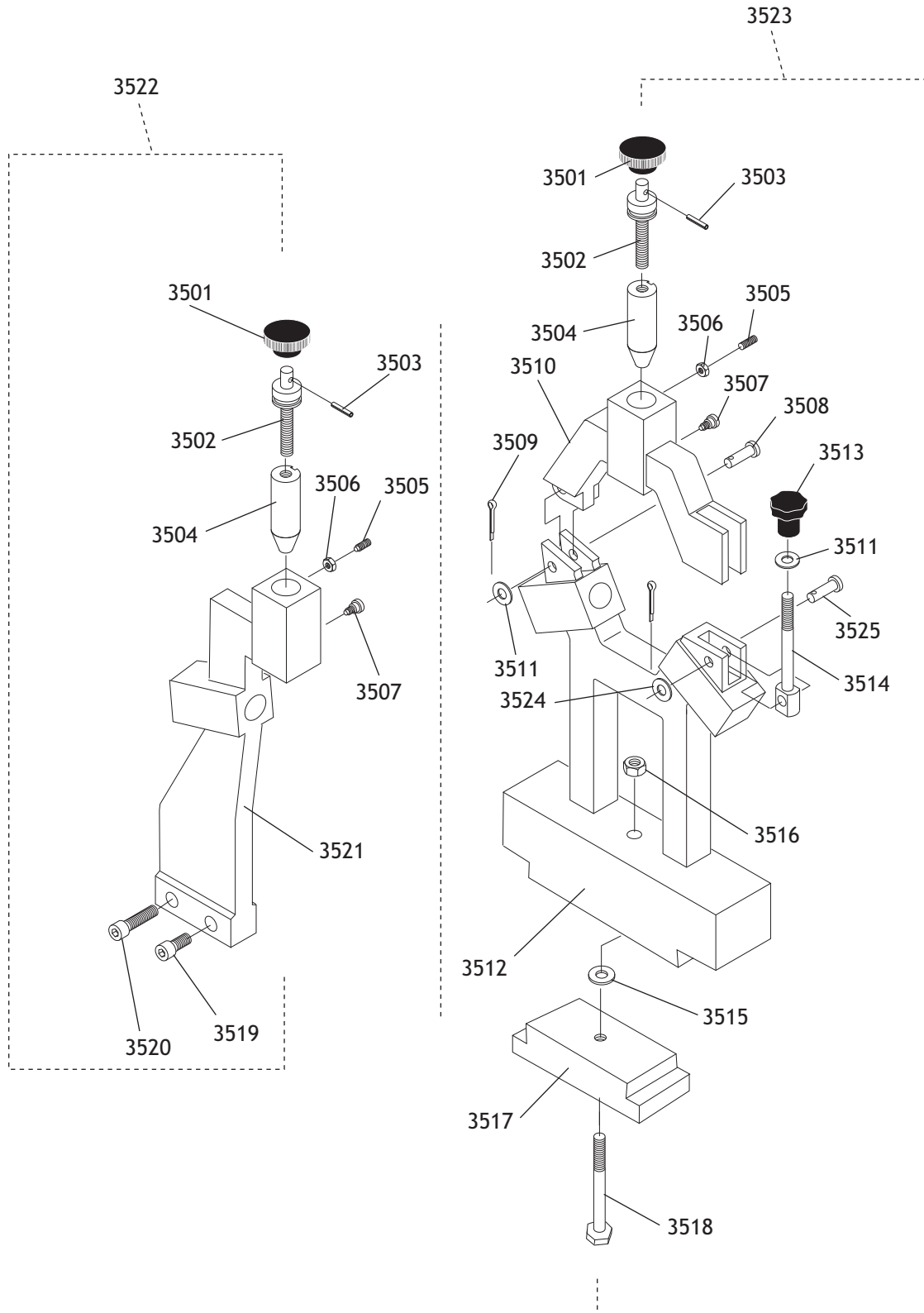


3000 Series Parts List

REF	PART #	DESCRIPTION
3001	XM11093001	BED
3002	XM11093002	RACK SET
3003	XM11093003	TAPER PIN
3004	XPSB11M	CAP SCREW M8-1.25 X 16
3005	XM11093005	CHOCK
3006	XM11093006	SPECIAL FLAT WASHER
3007	XPS08M	PHLP HD SCR M5-.8 X 12
3008	XPSS12M	SET SCREW SCR M6-1 X 25
3009	XPNO1M	HEX NUT M6-1
3010	XPSB48M	CAP SCREW M6-1 X 35
3011	XM11093011	BALL OILER 8MM
3012	XM11093012	TAPER PIN
3013	XPSB07M	CAP SCREW M6-1 X 30
3014	XPSB30M	CAP SCREW M6-1 X 45
3015	XPB47M	HEX BOLT M6-1 X 40
3016	XM11093016	WIPER
3017	XPFH07M	FLAT HD SCR M5-.8 X 10
3018	XM11093018	CHOCK
3019	XPSS09M	SET SCREW M8-1.25 X 20
3020	XPNO3M	HEX NUT M8-1.25
3021	XM11093021	WIPER
3022	XM11093022	BLOCK
3023	XM11093023	GEAR (20-TOOTH)
3024	XM11093024	CROSS FEED LEAD SCREW
3025	XPK08M	KEY 5 X 5 X 16
3026	XPK29M	KEY 4 X 4 X 8
3027	XP8201	BALL BEARING 8201
3028	XM11093028	STEEL BALL 6MM
3029	XPB83M	HEX BOLT M6-1 X 16
3030	XM11093030	TAPER PIN 5 X 20MM
3031	XM11093031	DIAL
3032	XM11093032	FLAT SPRING
3033	XM11093033	DIAL SLEEVE
3034	XM11093034	CRANK HANDLE
3035	XPNO41M	ACORN NUT M10-1.5
3036	XM11093036	LEAD SCREW NUT HOUSING
3037	XPSB12M	CAP SCREW M8-1.25 X 40
3038	XM11093038	L-BLOCK LONG
3039	XM11093039	L-BLOCK SMALL
3040	XM11093040	CARRIAGE
3041	XM11093041	WIPER
3042	XM11093042	WIPER
3043	XM11093028	BALL OILER 6MM

REF	PART #	DESCRIPTION
3044	XM11093044	CROSS NUT
3045	XM11093045	WORKTABLE
3046	XM11093046	LONGITUDINAL FEED SCREW
3047	XM11093047	LEADSCREW ENDCAP
3048	XM11093028	BALL OILER 6MM
3049	XPSB14M	CAP SCREW M8-1.25 X 20
3050	XM11093050	SLEEVE
3051	XM11093051	PLUG
3052	XM11093052	PLUG
3053	XM11093053	BUSHING
3054	XM11093054	TAPER PIN
3055	XPSB35M	CAP SCREW M8-1.25 X 60
3056	XM11093056	SPECIAL SET SCREW M5-.8 X 10
3057	XPRP91M	ROLL PIN 5 X 35
3058	XM11093058	LOCKING HANDLE SEAT
3059	XM11093059	LEVER
3060	XM11093060	FEMALE KNOB M10-1.5 X 32
3061	XPSB26M	CAP SCREW M6-1 X 12
3062	XM11093062	PEDESTAL
3063	XM11093063	SLEEVE
3064	XM11093064	CONTROL ROD
3065	XM11093065	SPECIAL SET SCREW M8-1.25 X 8
3066	XM11093066	COMPRESSION SPRING
3067	XM11093028	STEEL BALL 6MM
3068	XM11093068	SPECIAL SET SCREW M8-1.25 X 15
3069	XM11093069	COMPRESSION SPRING
3070	XM11093070	TAPER PIN
3071	XM11093071	COUPLING SLEEVE
3072	XM11093072	CAM LOBE
3072-1	XM11093072-1	LIMIT SWITCH
3073	XM11093073	SPECIAL SET SCREW M4-.7 X 6
3074	XM11093074	RACK SET
3075	XPW04M	FLAT WASHER 10MM
3076	XPSB47M	CAP SCREW M10-1.5 X 40
3077	XPSB84M	CAP SCREW M10-1.5 X 35
3078	XM11093078	SHIELD
3079	XPSB50M	CAP SCREW M5-.8 X 10
3080	XM11093080	TAPER PIN
3081	XM11093081	WORM WHEEL
3082	XPSB29M	CAP SCREW M6-1 X 40
3083	XM11093083	THREAD INDICATOR
3084	XM11093084	THREAD DIAL HOUSING
3085	XPNO1M	HEX NUT M6-1

Steady Rest and Follow Rest Diagram (3500 Series Parts)

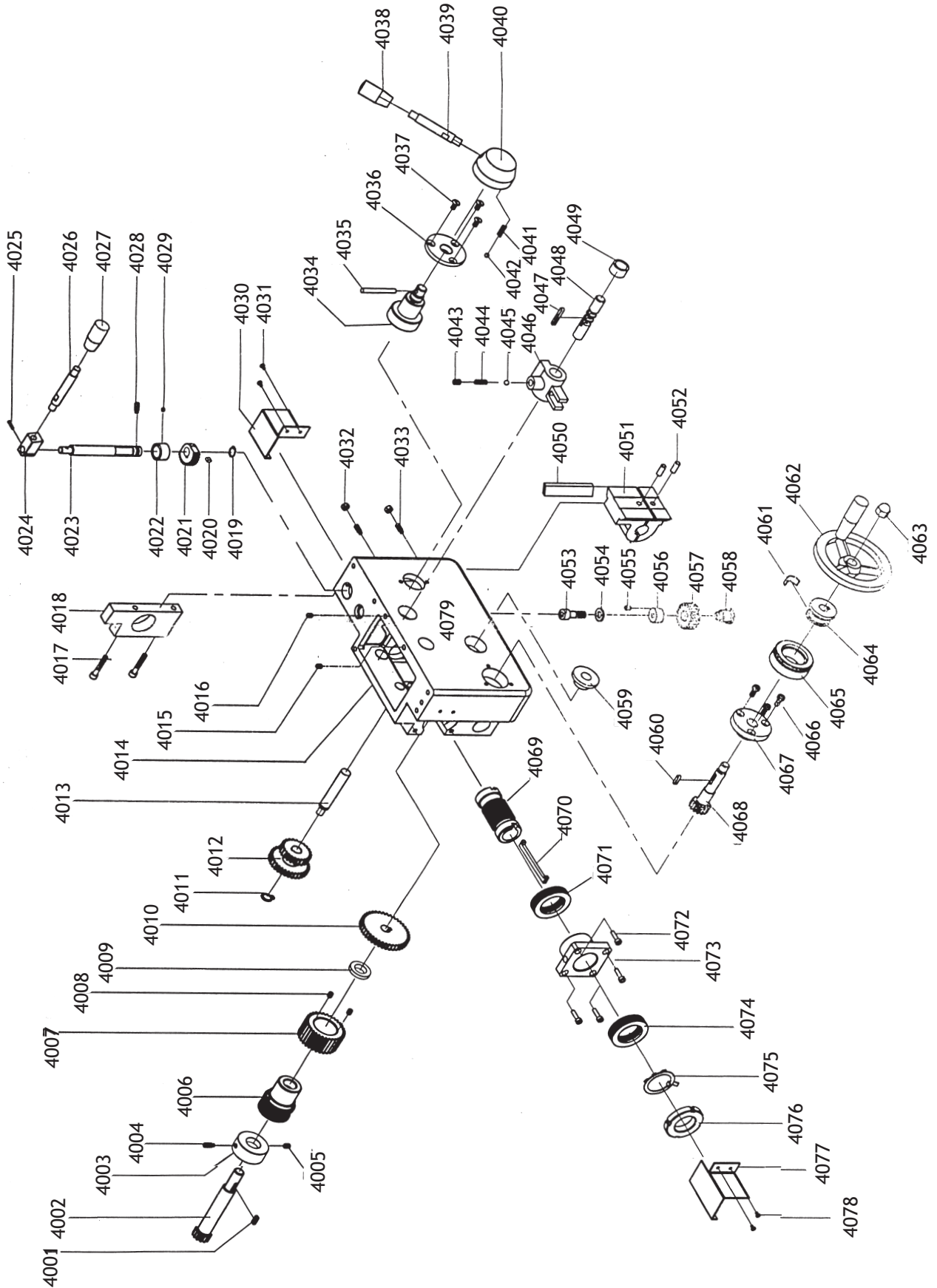


3500 Series Parts List

REF	PART #	DESCRIPTION
3501	XM11093501	PINNED KNOB
3502	XM11093502	ADJUSTMENT STUD
3503	XM11093503	TAPERED PIN
3504	XM11093504	BRASS-TIPPED FINGER
3505	XM11093505	SPECIAL SET SCREW M6-1
3506	XPN01M	HEX NUT M6-1
3507	XM11093507	THUMB KNOB M6-1.0 X 20
3508	XM11093508	CLEVIS PIN 8 X 32MM
3509	XM11093509	COTTER PIN 3 X 25MM
3510	XM11093510	STEADY REST HEAD
3511	XPW01M	FLAT WASHER 8MM
3512	XM11093512	STEADY REST BASE
3513	XM11093513	FEMALE KNOB M8-1.25

REF	PART #	DESCRIPTION
3514	XM11093514	SPECIAL EYE BOLT
3515	XPW04M	FLAT WASHER 10MM
3516	XPN02M	HEX NUT M10-1.5
3517	XM11093517	CHOCK
3518	XPB120M	HEX BOLT M10-1.5 X 65
3519	XPSB14M	CAP SCREW M8-1.25 X 20
3520	XPSB31M	CAP SCREW M8-1.25 X 25
3521	XM11093521	FOLLOW REST CASTING
3522	XM11093522	COMPLETE FOLLOW REST
3523	XM11093523	COMPLETE STEADY REST
3524	XPW03M	FLAT WASHER 6MM
3525	XM11093525	CLEVIS PIN 6 X 32MM

Apron Diagram (4000 Series Parts)

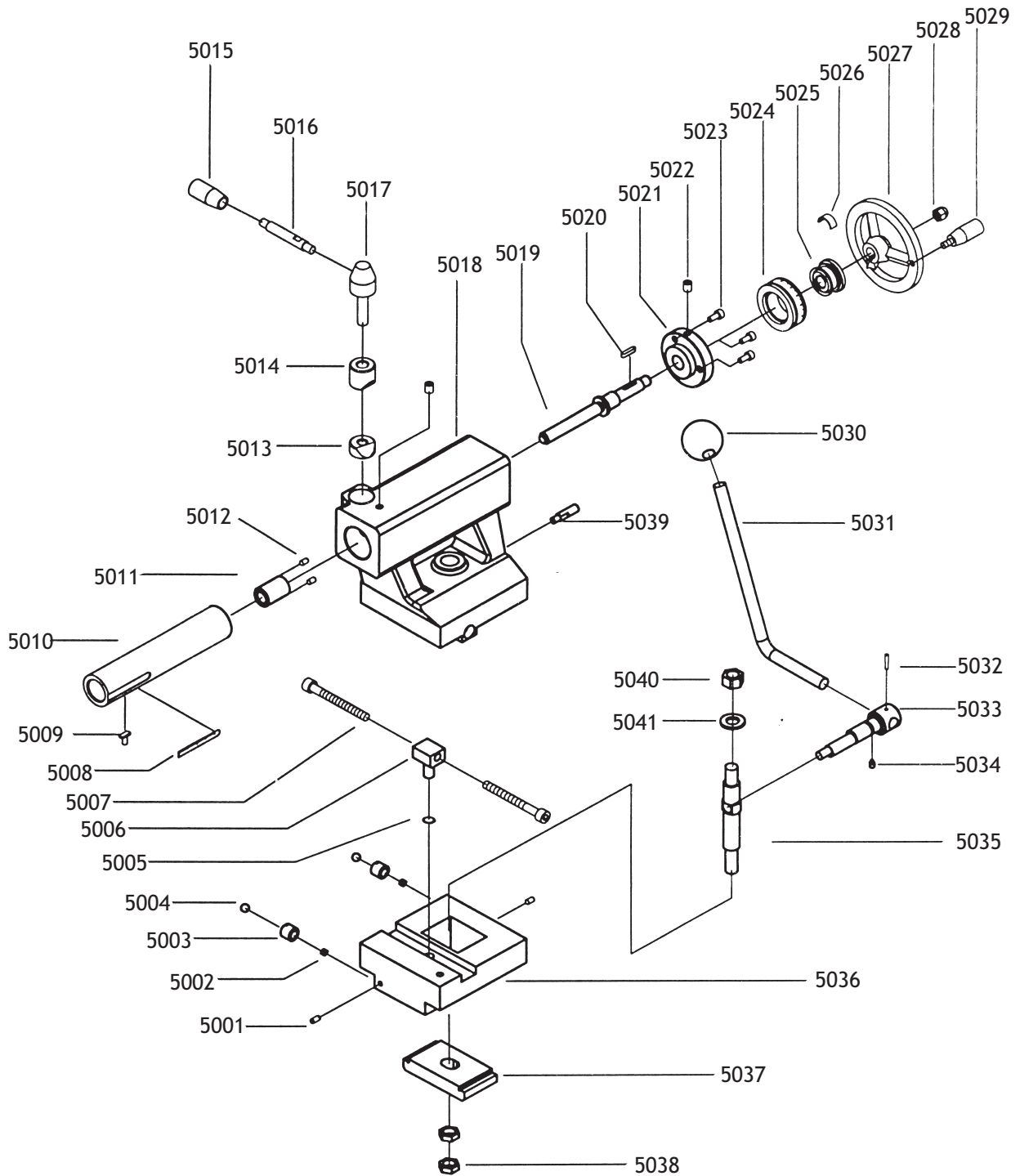


4000 Series Parts List

REF	PART #	DESCRIPTION
4001	XPK81M	KEY 6 X 6 X 12
4002	XM11094002	GEAR SHAFT
4003	XM11094003	LOCK COLLAR
4004	XM11094004	SET SCREW M6-1.0 X 12
4005	XM11094005	SPECIAL SET SCREW M6-1.0 X 12
4006	XM11094006	WORM GEAR
4007	XM11094007	GEAR (40-TOOTH)
4008	XM11094008	SPECIAL SET SCREW M5-.8 X 8
4009	XM11094009	SPACER
4010	XM11094010	GEAR (60-TOOTH)
4011	XPR09M	EXT RETAINING RING 20MM
4012	XM11094012	CLUSTER GEAR
4013	XM11094013	SHAFT
4014	XM11094014	CASE
4015	XM11094015	SPECIAL SET SCREW M5-.8 X 16
4016	XM11094016	SPECIAL SET SCREW M6-1.0 X 20
4017	XPSB79M	CAP SCREW M5-.8 X 35
4018	XM11094018	APRON END BLOCK
4019	XPR03M	EXT RETAINING RING 12MM
4020	XPK29M	KEY 4 X 4 X 8
4021	XM11094021	GEAR (30-TOOTH)
4022	XM11094022	SPACER
4023	XM11094023	SHAFT
4024	XM11094024	ANGLE BLOCK
4025	XM11094025	TAPER PIN
4026	XM11094026	LEVER
4027	XM11094027	FEMALE KNOB M8-1.25 X 40MM
4028	XPSS34M	SET SCREW M5-.8 X 16
4029	XM11094029	SPECIAL SET SCREW M5-.8 X 8
4030	XM11094030	COVER
4031	XPS05M	PHLP HD SCR M5-.8 X 8
4032	XPNO6M	HEX NUT M5-.8
4033	XM11094033	SPECIAL SET SCREW M5-.8 X 25
4034	XM11094034	STUB HUB
4035	XM11094035	TAPER PIN
4036	XM11094036	FLANGE HUB
4037	XPFH25M	FLAT HD SCR M4-.7 X 12
4038	XM11094038	FEMALE KNOB M8-1.25 X 40MM
4039	XM11094039	LEVER
4040	XM11094040	LEVER HUB

REF	PART #	DESCRIPTION
4041	XM11094041	COMPRESSION SPRING
4042	XM11094042	STEEL BALL 6.5MM
4043	XM11094043	SPECIAL SET SCREW M6-1.0 X 8
4044	XM11094044	COMPRESSION SPRING
4045	XM11094045	STEEL BALL 5MM
4046	XM11094046	SHIFTING FORK
4047	XPK02M	KEY 5 X 5 X 40
4048	XM11094048	SHIFTING FORK SHAFT
4049	XM11094049	SLEEVE
4050	XM11094050	GIB
4051	XM11094051	HALF NUT SET
4052	XM11094052	ALIGNMENT PINS 6 X 8MM
4053	XPSB06M	CAP SCREW M6-1 X 25
4054	XPLW03M	LOCK WASHER 6MM
4055	XM11094055	SPECIAL SET SCREW M4-.7 X 8
4056	XM11094056	SLEEVE
4057	XM11094057	MIDDLE GEAR
4058	XM11094058	STUB HUB
4059	XM11094059	BEARING SLEEVE
4060	XPK125M	KEY 4 X 4 X 28
4061	XM11094061	FLAT SPRING
4062	XM11094062	HAND WHEEL
4063	XPN42M	ACORN NUT M12 X 1.5
4064	XM11094064	SLEEVE
4065	XM11094065	DIAL
4066	XPS02M	PHLP HD SCR M4-.7 X 12
4067	XM11094067	FLANGE SLEEVE
4068	XM11094068	GEAR SHAFT
4069	XM11094069	WORM SHAFT
4070	XM11094070	SADDLE KEY 4 X 28
4071	XP8106	THRUST BEARING 8106
4072	XPSB24M	CAP SCREW M5-.8 X 16
4073	XM11094073	FIXED FLANGE HUB
4074	XP8106	THRUST BEARING 8106
4075	XM11094075	TANG WASHER
4076	XM11094076	SPANNER NUT M30-1.5
4077	XM11094077	PLATE
4078	XPS05M	PHLP HD SCR M5-.8 X 8
4079	XM11094079	HOUSING

Tailstock Diagram (5000 Series Parts)

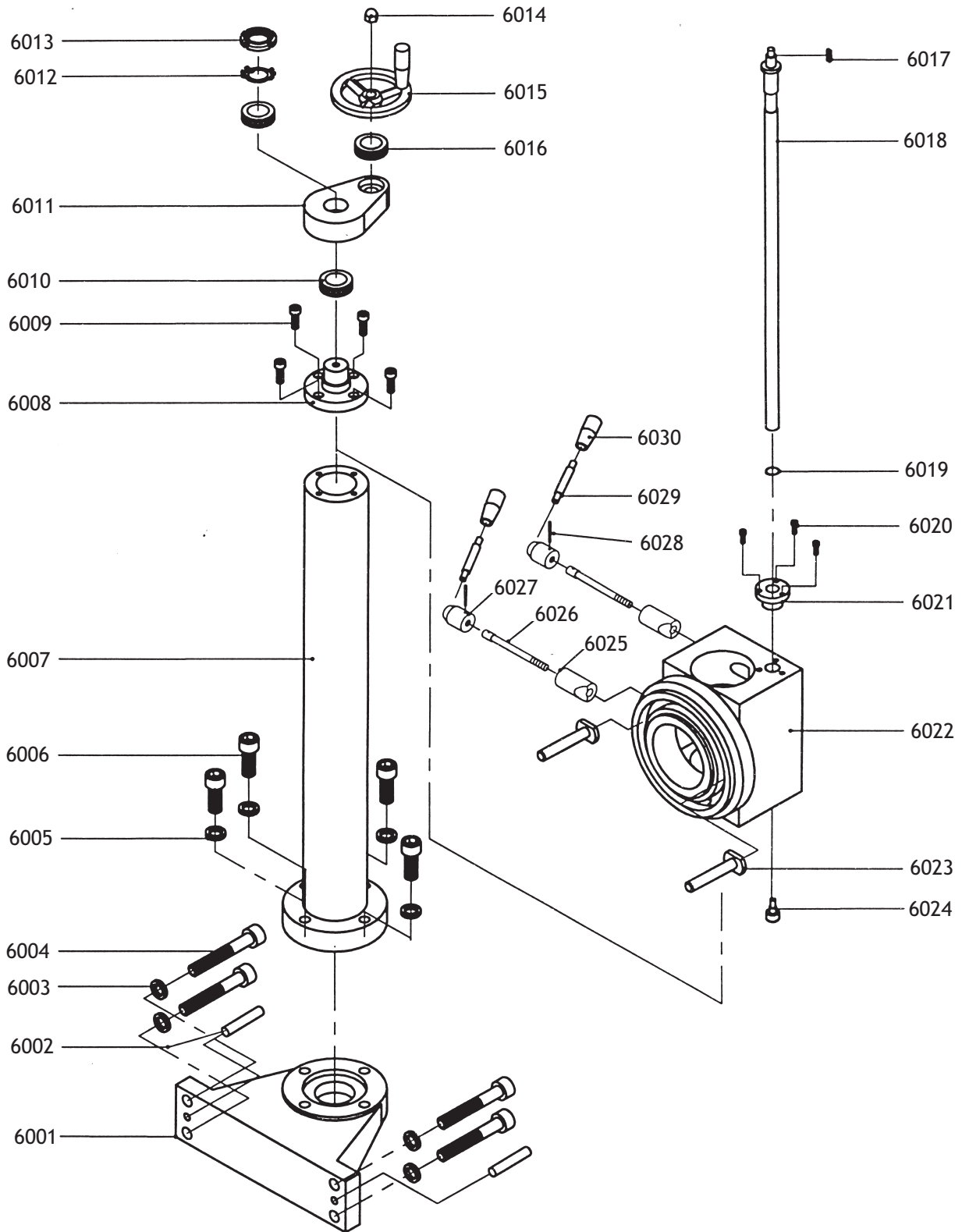


5000 Series Parts List

REF	PART #	DESCRIPTION
5001	XM11095001	SPECIAL SET SCREW M5-.8 X 8
5002	XM11095002	COMPRESSION SPRING
5003	XM11095003	BALL OILER
5004	XM11095004	STEEL BALL 8MM
5005	XPR03M	EXT RETAINING RING 12MM
5006	XM11095006	DOWEL NUT
5007	XPSB12M	CAP SCREW M8-1.25 X 40
5008	XM11095008	SCALE LABEL
5009	XM11095009	T-KEY
5010	XM11095010	BARREL
5011	XM11095011	COLLAR SLEEVE
5012	XM11095012	SPECIAL SET SCREW M5-.8 X 10
5013	XM11095013	WEDGE NUT
5014	XM11095014	WEDGE SLEEVE
5015	XM11095015	FEMALE KNOB M8-1.25 X 40MM
5016	XM11095016	LEVER
5017	XM11095017	LEVER HUB
5018	XM11095018	TAILSTOCK HOUSING
5019	XM11095019	TAILSTOCK STEM
5020	XPK125M	KEY 4 X 4 X 28
5021	XM11095021	FLANGE HUB

REF	PART #	DESCRIPTION
5022	XM11093028	BALL OILER 6MM
5023	XPSB33M	CAP SCREW M5-.8 X 12
5024	XM11095024	DIAL
5025	XM11095025	SLEEVE
5026	XM11095026	FLAT SPRING
5027	XM11095027	HAND WHEEL
5028	XPN41M	ACORN NUT M10-1.5
5029	XM11095029	HANDLE
5030	XM11095030	FEMALE KNOB M10-1.5 X 32
5031	XM11095031	LEVER
5032	XM11095032	TAPER PINS
5033	XM11095033	SHAFT
5034	XM11095034	SPECIAL SET SCREW M5-.8 X 12
5035	XM11095035	PULL SHAFT
5036	XM11095036	BASE
5037	XM11095037	CHOCK
5038	XM11095038	SPECIAL HEX NUT M12-1.5
5039	XM11095039	PIN
5040	XM11095040	SPECIAL HEX NUT M12-1.75
5041	XPW06M	FLAT WASHER 12MM

Mill Column Diagram (6000 Series Parts)

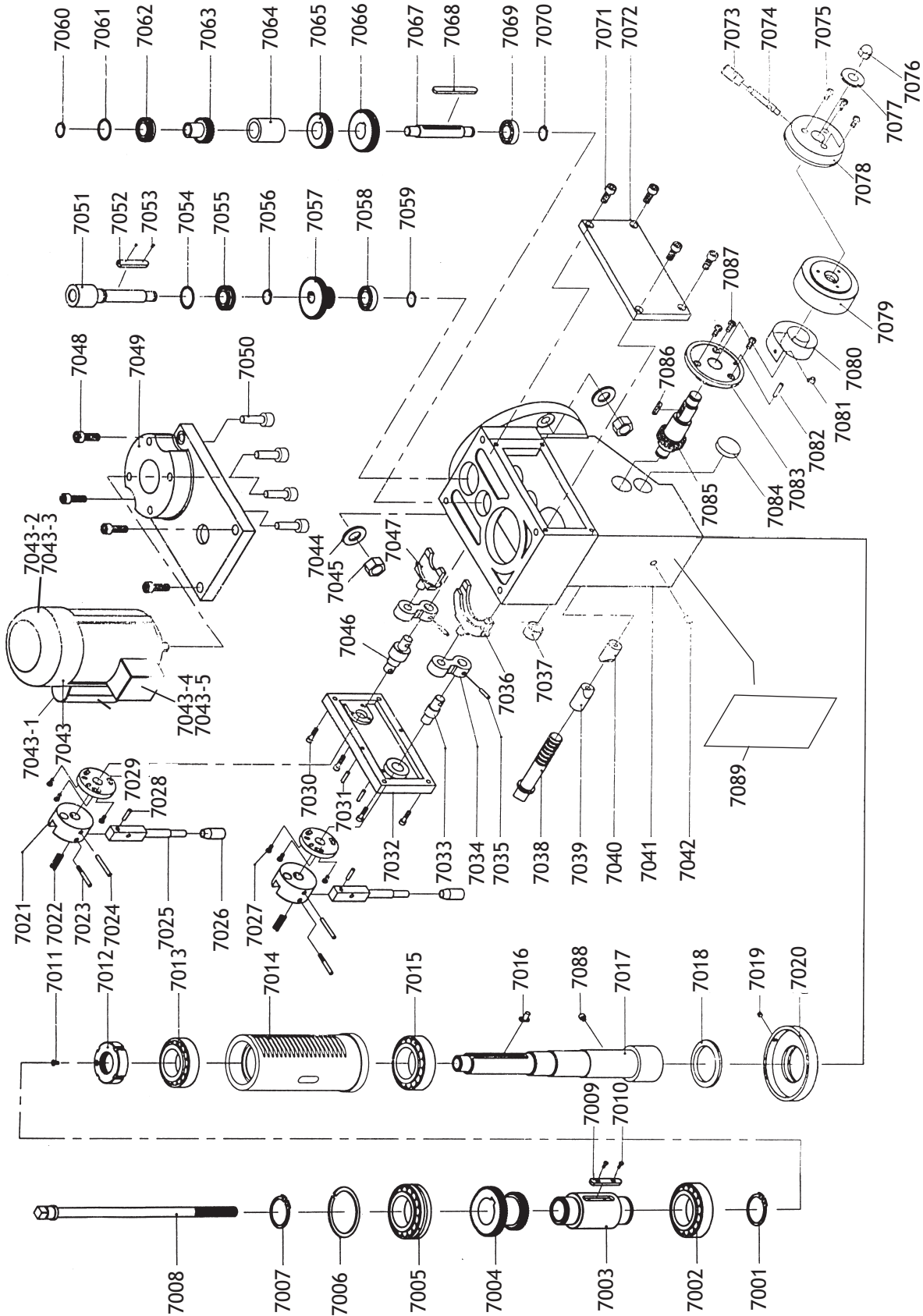


6000 Series Parts List

REF	PART #	DESCRIPTION
6001	XM11096001	PEDESTAL
6002	XM11096002	TAPER PIN
6003	XPLW05M	LOCK WASHER 12MM
6004	XPSB92M	CAP SCREW M12-1.75 X 40
6005	XPLW05M	LOCK WASHER 12MM
6006	XPSB119M	CAP SCREW M12-1.75 X 55
6007	XM11096007	COLUMN
6008	XM11096008	COLUMN FLANGE
6009	XPSB02M	CAP SCREW M6-1 X 20
6010	XP8106	BALL BEARING 8106
6011	XM11096011	COLUMN BRACKET
6012	XM11096012	TANG WASHER
6013	XM11096013	SPANNER NUT M30-1.5
6014	XPN41M	ACORN NUT M10-1.5
6015	XM11096015	HAND WHEEL

REF	PART #	DESCRIPTION
6016	XP8103	BALL BEARING 8103
6017	XP69M	KEY 4 X 4 X 12
6018	XM11096018	HEADSTOCK LEAD SCREW
6019	XPR18M	EXT RETAINING RING 17MM
6020	XPSB06M	CAP SCREW M6-1 X 25
6021	XM11096021	LEADSCREW NUT
6022	XM11096022	COLUMN BRACKET
6023	XM11096023	T-BOLT
6024	XM11096024	SPECIAL SHOULDER SCREW
6025	XM11096025	WEDGE SLEEVE
6026	XM11096026	LOCK STUD
6027	XM11096027	LEVER HUB
6028	XM11096028	TAPER PIN
6029	XM11096029	LEVER
6030	XM11096030	FEMALE KNOB M8-1.25 X 40

Headstock Diagram (7000 Series Parts)



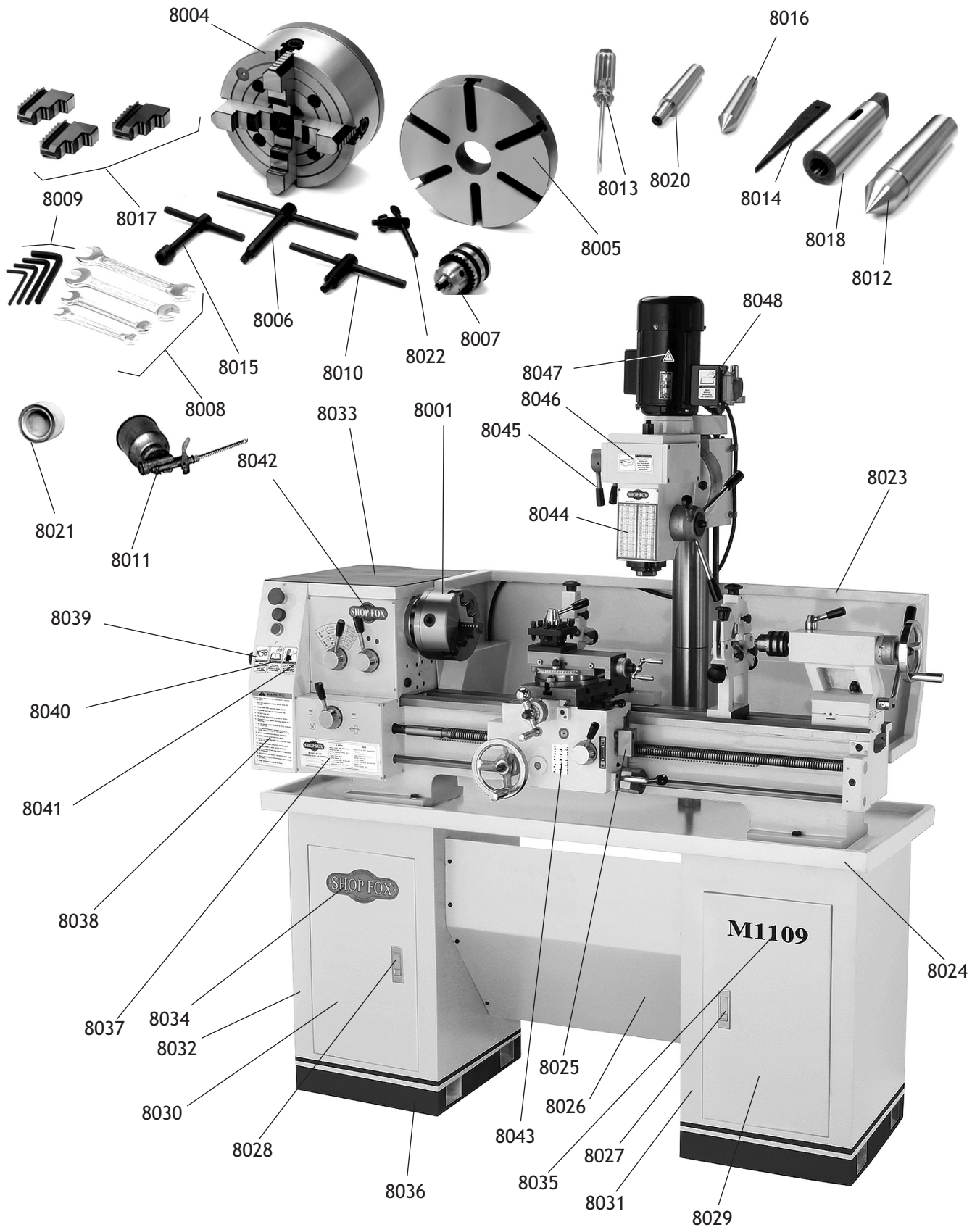
PARTS

7000 Series Parts List

REF	PART #	DESCRIPTION
7001	XPR12M	EXT RETAINING RING 35MM
7002	XM11097002	ROLLER BEARING 207
7003	XM11097003	SHAFT SLEEVE
7004	XM11097004	CLUSTER GEAR
7005	XM11097005	BALL BEARING 50207
7006	XM11097006	BEARING LOOP
7007	XPR12M	EXT RETAINING RING 35MM
7008	XM11097008	DRAW BAR 7/16-20
7009	XM11097009	SPECIAL KEY
7010	XM11097010	SPECIAL SET SCREW M3-.5 X 8
7011	XPFH31M	FLAT HD SCR M4-.7 X 8
7012	XM11097012	SPANNER NUT M30-1.5
7013	XM11097013	TAPER ROLLER BEARING 2007106
7014	XM11097014	RACK
7015	XM11097015	TAPER ROLLER BEARING D2007107
7016	XM11097016	T-KEY
7017	XM11097017	SPINDLE (R8)
7018	XM11097018	FELT SEAT
7019	XM11097019	SPECIAL SET SCREW M4-.7 X 12
7020	XM11097020	BEARING CAP
7021	XM11097021	LEVER HUB
7022	XM11097022	COMPRESSION SPRING
7023	XM11097023	PIVOT STUD
7024	XM11097024	TAPER PIN
7025	XM11097025	LEVER
7026	XM11097026	FEMALE KNOB M8-1.25 X 40MM
7027	XPSB18M	CAP SCREW M4-.7 X 8
7028	XM11097028	STRAIGHT PIN
7029	XM11097029	LOCATING PLATE
7030	XPSB24M	CAP SCREW M5-.8 X 16
7031	XM11097031	TAPER PIN
7032	XM11097032	SHIFTER COVER
7033	XM11097033	SHIFTING FORK SHAFT
7034	XM11097034	ROCKER ARM
7035	XM11097035	TAPER PIN
7036	XM11097036	LARGE SHIFT FORK
7037	XM11097037	END SLEEVE
7038	XM11097038	LOCK STUD
7039	XM11097039	SLEEVE NUT
7040	XM11097040	WEDGE NUT
7041	XM11097041	GEARBOX CASE
7042	XPSB76M	CAP SCREW M8-1.25 X 18
7043	XM11097043	MOTOR 220V 3/4 HP
7043-1	XM11097043-1	CAPACITOR 200UF/250VAC
7043-2	XM11097043-2	FAN COVER
7043-3	XM11097043-3	FAN
7043-4	XM11097043-4	POWER SWITCH (KJD12, 230VAC, 5E4)

REF	PART #	DESCRIPTION
7043-5	XM11097043-5	POWER SWITCH BOX
7044	XPW04M	FLAT WASHER 10MM
7045	XPN02M	HEX NUT M10-1.5
7046	XM11097046	SHIFTING FORK SHAFT
7047	XM11097047	SMALL SHIFTING FORK
7048	XPSB14M	CAP SCREW M8-1.25 X 20
7049	XM11097049	MOTOR MOUNT PLATE
7050	XPSB02M	CAP SCREW M6-1 X 20
7051	XM11097051	INPUT SHAFT
7052	XPK112M	KEY 5 X 5 X 50
7053	XM11097053	SPECIAL SCREW
7054	XM11097054	BEARING LOOP
7055	XP50207	BALL BEARING 50207
7056	XPR18M	EXT RETAINING RING 17MM
7057	XM11097057	CLUSTER GEAR
7058	XP60201	BALL BEARING 60201
7059	XPR03M	EXT RETAINING RING 12MM
7060	XPR03M	EXT RETAINING RING 12MM
7061	XM11097061	BEARING LOOP
7062	XP50207	BALL BEARING 50207
7063	XM11097063	GEAR (21-TOOTH)
7064	XM11097064	SPACER
7065	XM11097065	GEAR (39-TOOTH)
7066	XM11097066	GEAR (45-TOOTH)
7067	XM11097067	IDLER SHAFT
7068	XPK112M	KEY 5 X 5 X 55
7069	XP60201	BALL BEARING 60201
7070	XPR03M	EXT RETAINING RING 12MM
7071	XPSB24M	CAP SCREW M5-.8 X 16
7072	XM11097072	GEARBOX COVER
7073	XM11097073	FEMALE KNOB M8-1.25 X 40
7074	XM11097074	LEVER
7075	XPFH41M	FLAT HD SCR M4-.7 X 16
7076	XPN18M	ACORN NUT M8-1.25
7077	XM11097077	ADJUSTMENT WASHER
7078	XM11097078	LEVER HUB
7079	XM11097079	CALIBRATED DIAL
7080	XM11097080	COILED FLAT SPRING
7081	XPS07M	PHLP HD SCR M4-.7 X 8
7082	XM11097082	PIN
7083	XM11097083	FLANGE HUB
7084	XM11097084	CAP
7085	XM11097085	PINION GEAR SHAFT
7086	XPK06M	KEY 5 X 5 X 10
7087	XPB96M	HEX BOLT M5-.8 X 10
7088	XM11097088	SPECIAL SHOULDER SCREW
7089	XM11097089	CONVERSION DATA PLATE

Accessories and Labels Diagram (8000 Series Parts)



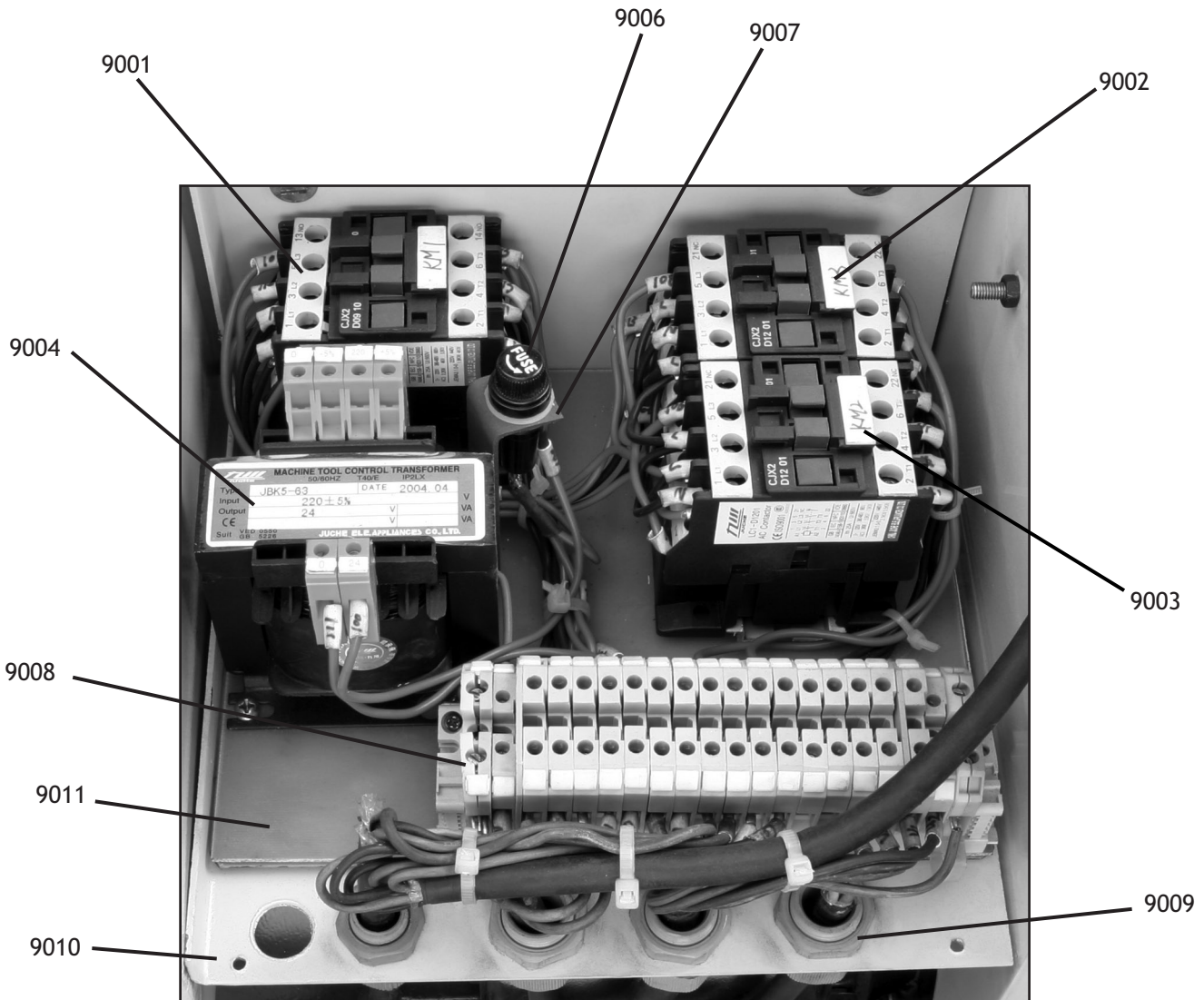
PARTS

8000 Series Parts List

REF	PART #	DESCRIPTION
8001	XM11098001	6" THREE-JAW CHUCK
8004	XM11098004	8" FOUR-JAW UNIVERSAL CHUCK
8005	XM11098005	8" FACEPLATE
8006	XM11098006	FOUR-JAW CHUCK KEY
8007	XM11098007	DRILL CHUCK (1-13MM, JT-33)
8008	XM11098008	WRENCH SET (8/10, 10/12, 14/17, 17/19 MM)
8008-1	XM11098008-1	COMBINATION WRENCH 8/10
8008-2	XM11098008-2	COMBINATION WRENCH 10/12
8008-3	XM11098008-3	COMBINATION WRENCH 14/17
8008-4	XM11098008-4	COMBINATION WRENCH 17/19
8009	XM11098009	HEX WRENCH SET (2, 4, 6, 8, MM)
8009-1	XPAW02M	HEX WRENCH 4MM
8009-2	XPAW04M	HEX WRENCH 4MM
8009-3	XPAW06M	HEX WRENCH 6MM
8009-4	XPAW08M	HEX WRENCH 8MM
8010	XM11098010	THREE-JAW CHUCK KEY
8011	XM11098011	OIL CAN
8012	XM11098012	DEAD CENTER MT#5
8013	XM11098013	STANDARD SCREWDRIVER #2
8014	XM11098014	WEDGE
8015	XM11098015	TOOL POST T-HANDLE WRENCH
8016	XM11098016	DEAD CENTER MT#3
8017	XM11098017	THREE-JAW CHUCK INT. JAWS
8018	XM11098018	TAPER ADAPTER MT#3 TO MT#5
8020	XM11098020	ARBOR JT-33 TO MT#3
8021	XM11098021	SPOT PAINT

REF	PART #	DESCRIPTION
8022	XM11098022	DRILL CHUCK KEY
8023	XM11098023	BACK SPLASH
8024	XM11098024	CHIP TRAY
8025	XM11098025	THREAD DIAL
8026	XM11098026	KICK PANEL
8027	XM11098027	COMPLETE RT DOOR LATCH ASSY
8028	XM11098028	COMPLETE LFT DOOR LATCH ASSY
8029	XM11098029	RT DOOR W/HINDGES AND LOCK
8030	XM11098030	LFT DOOR W/HINDGES AND LOCK
8031	XM11098031	COMPLETE RT CABINET W/DOOR
8032	XM11098032	COMPLETE LFT CABINET W/DOOR
8033	XM11098033	RUBBER MAT
8034	XM11098034	SHOP FOX LOGO PLATE
8035	XM11098035	M1109 LABEL
8036	XM11098036	BLACK TRIM TAPE
8037	XM11098037	DATA LABEL
8038	XM11098038	GENERAL WARNING LABEL
8039	XM11098039	WEAR EYEPROTECTION LABEL
8040	XM11098040	READ MANUAL FIRST LABEL
8041	XM11098041	TIE BACK LOOSE CLOTHING LABEL
8042	XM11098042	SHOP FOX DOMED LOGO LABEL
8043	XM11098043	THREAD DIAL CHART LABEL
8044	XM11098044	INCH/METRIC CONVERSION CHART
8045	XM11098045	MILL GEAR BOX SPEED LABEL
8046	XM11098046	WEAR EYEPROTECTION LABEL
8047	XM11098047	ELECTRICAL HAZARD LABEL
8048	XM11098048	READ MANUAL FIRST LABEL

Main Wiring Box Diagram (9000 Series Parts)



9000 Series Parts List

REF	PART #	DESCRIPTION
9001	XM11099001	CONTACTOR (LC1-D0910, B5, 24V, 50HZ)
9002	XM11099002	CONTACTOR (LC1-D1201, B5, 24V, 50HZ)
9003	XM11099003	CONTACTOR (LC1-D1201, B5, 24V, 50HZ)
9004	XM11099004	TRANSFORMER (JBK5-63), (INPUT 220V +/- 5%, OUTPUT 24V)

REF	PART #	DESCRIPTION
9006	XM11099006	FUSE 2A
9007	XM11099007	FUSE HOUSING
9008	XM11099008	TERMINAL BLOCK
9009	XM11099009	STRAIN RELIEF
9010	XM11099010	ELECTRICAL BOX
9010-1	XM11099010-1	ELECTRICAL BOX COVER
9011	XM11099011	CONTACTOR MOUNTING PLATE

Notes

Warranty

Woodstock International, Inc. warrants all **SHOP FOX**[®] machinery to be free of defects from workmanship and materials for a period of two years from the date of original purchase by the original owner. This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence or accidents, lack of maintenance, or reimbursement of third party expenses incurred.

Woodstock International, Inc. will repair or replace, at its expense and at its option, the **SHOP FOX**[®] machine or machine part which in normal use has proven to be defective, provided that the original owner returns the product prepaid to the **SHOP FOX**[®] factory service center or authorized repair facility designated by our Bellingham, WA office, with proof of their purchase of the product within two years, and provides Woodstock International, Inc. reasonable opportunity to verify the alleged defect through inspection. If it is determined there is no defect, or that the defect resulted from causes not within the scope of Woodstock International Inc.'s warranty, then the original owner must bear the cost of storing and returning the product.

This is Woodstock International, Inc.'s sole written warranty and any and all warranties that may be implied by law, including any merchantability or fitness, for any particular purpose, are hereby limited to the duration of this written warranty. We do not warrant that **SHOP FOX**[®] machinery complies with the provisions of any law or acts. In no event shall Woodstock International, Inc.'s liability under this warranty exceed the purchase price paid for the product, and any legal actions brought against Woodstock International, Inc. shall be tried in the State of Washington, County of Whatcom. We shall in no event be liable for death, injuries to persons or property or for incidental, contingent, special or consequential damages arising from the use of our products.

Every effort has been made to ensure that all **SHOP FOX**[®] machinery meets high quality and durability standards. We reserve the right to change specifications at any time because of our commitment to continuously improve the quality of our products.

Warranty Registration

Name _____
Street _____
City _____ State _____ Zip _____
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Model # _____ Serial # _____ Dealer Name _____ Purchase Date _____

The following information is given on a voluntary basis. It will be used for marketing purposes to help us develop better products and services. Of course, all information is strictly confidential.

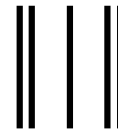
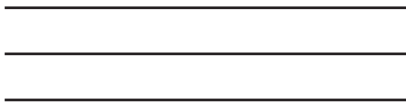
1. How did you learn about us?
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2. How long have you been a woodworker/metalworker?
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4. Do you think your machine represents a good value? Yes No
5. Would you recommend Shop Fox® products to a friend? Yes No
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7. What is your annual household income?
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<input type="checkbox"/> Model Airplane News	<input type="checkbox"/> Rifle	<input type="checkbox"/> Woodworker's Journal
<input type="checkbox"/> Modeltec	<input type="checkbox"/> Shop Notes	<input type="checkbox"/> Other:
<input type="checkbox"/> Old House Journal	<input type="checkbox"/> Shotgun News	

9. Comments: _____

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